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# INVESTIGATION OF ENVIRONMENTAL OCCURRENCE OF ASBESTIFORM FIBERS IN ST. LAWRENCE COUNTY

FEBRUARY, 1987

NEW YORK STATE DEPARTMENT OF HEALTH
BUREAU OF TOXIC SUBSTANCE ASSESSMENT

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SUMMARY

Concern over the potential for excess lung and pleura abnormalities among residents of St. Lawrence and Jefferson Counties motivated a case history study of radiographic chest abnormalities and exposure to asbestiform minerals in the area. The portion of the investigation reported here is intended to identify potential environmental sources of asbestiform minerals; environmental sampling efforts were concentrated within the Gouverneur-Balmat-Edwards Mining District. Asbestiform minerals which were of most concern were tremolite, anthophylite and actinolite. Chrysotile asbestiform materials may be associated with talc minerals, but are not frequently or extensively found. Talc materials often contain varying amounts of the above-noted asbestos minerals, but are most likely not in a fibrous form. Included was an assessment of soils, water, tailing wastes and ambient outdoor air. This limited study did not indicate a wide distribution of asbestiform fibers in the environment in the Gouverneur-Balmat-Edwards area.

This investigation was designed as the first phase of a large study. If the first phase of the investigation had demonstrated the occurrence of asbestiform fibers in the environment in the Gouverneur-Balmat-Edwards area, a second phase would have been implemented to progressively evaluate areas farther from the mining district in a northeasterly direction from Gouverneur to Massena, the northeasterly orientation selected on the basis of predominant wind direction during the spring, summer and fall seasons and because any extensive past migration of asbestos materials would be windborne. Because the results of the initial reconnaissance did not indicate a wide distribution of asbestiform fibers, the second phase of the investigation was not carried out.

# INVESTIGATION OF ENVIRONMENTAL OCCURRENCE OF ASBESTIFORM FIBERS IN ST. LAWRENCE COUNTY

## INTRODUCTION

Because the surficial geology of the southwestern portion of St. Lawrence County is associated with calsilicate bedrock, which could contribute to distribution of asbestiform minerals in the environment, the investigation was designed to determine whether asbestiform fibers are widely distributed in environmental media. The release of such fibers from the surficial geological structures may be related to natural weathering processes, disturbance incidental to mining or road construction activities and agricultural activities when soils contain asbestiform minerals.

Environmental samples analyzed for asbestiform minerals are important only from a qualitative standpoint in that they provide a means of "tracking" distribution of these minerals. Interpretation of the quantitative amounts found for a given sample type may best represent a relative index since trace amounts of asbestos minerals may be found naturally distributed due to the occurrence of serpentine and amphibole rocks particularly in mountainous regions. In summary, this reconnaissance study was intended to establish a "benchmark" (if any) of environmental asbestiform sources within the primary mining district of southwestern St. Lawrence County and to profile similar environmental sources within a corridor defined between Governeur and Massena, New York. This study provides the environmental evaluation to support a parallel case history study of radiographic chest abnormalities and exposure to asbestiform minerals in the Gouverneur-Balmat-Edwards area.

OBJECTIVES

The investigation was limited to St. Lawrence County and contiguous areas and was designed to:

1. Determine potential industrial, commercial and natural sources of asbestos minerals in the environment.
2. Investigate potential non-occupational exposure to asbestos fibers.
3. Measure the geographicl extent of asbestos or asbestos-related minerals in the environment which may be associated with potential human exposure.

PROGRAM PLAN

This investigation was designed to be conducted in two phases to meet the study objectives. Phase I and II differed in terms of geographical areas to be covered and the number and types of environmental samples to be collected and analyzed.

PHASE I:

Phase I evaluated the Gouverneur-Edwards-Balmat Mining District which is known to be associated both geologically and industrially with asbestos-

The purpose of this phase was to determine if the Gouverneur-Edwards-Balmat Mining District was a potential source of environmental asbestos minerals and which due to the almost continuous mining and mineral processing activities since 1880 may have contributed to a redistribution of asbestos-related minerals to a broader regional area within St. Lawrence County. Several locations are shown in the Appendix A - Map No. 7.

PHASE II:

The purpose of this phase was to evaluate a portion of St. Lawrence County outside the mining district area of Phase I in a manner similar to that adopted in the initial phase. Based upon the results of Phase I, it was concluded that Phase II would not be implemented.

STANDARDIZATION OF COLLECTION METHODS AND TYPES OF ENVIRONMENTAL SAMPLES

A variety of types of environmental samples were collected and analyzed to evaluate the presence of asbestiform fibers. There are no standardized procedures for such analyses; a description of the media sampled and the analytical procedures is presented herein. The examination and qualitative analyses are intended to establish the presence or absence of asbestiform materials within the study area.

SOIL SAMPLES

Various types of soil samples were collected to represent tailing wastes and the natural or man-made redistribution of such materials over a larger geographical area. Surface soil samples were collected within tailing waste disposal areas and roads and residential driveways apparently consisting of tailing waste disposal materials. These samples were obtained by scooping samples directly into a scintillation container. Approximately one cubic inch of material was taken.

Comparative soil samples in cultivated and uncultivated areas were collected both in zones that overlay calsilicate bedrock and zones that did not. The relationship of samples to bedrock structure was noted. Samples were collected by removal of a core of soil to a depth of four inches from the surface. Any vegetation present was removed after soil adhering to the root zone was shaken out and included as part of the sample. The soil mass was placed in a plastic quart container.

## VEGETATION SAMPLES

Vegetation leaf samples were intended to represent airborne dust materials deposited by wind action and air movement caused by vehicular traffic during the current growing season and to demonstrate the potential of asbestiform materials from primary sources to become airborne for redistribution. Vegetation samples were visually dusted broad leaf plant specimens collected adjacent to (1) an active tailing waste disposal area, (2) road or residential driveways using tailing waste materials, (3) sites representing active farmland, and (4) sites not closely associated with the preceding conditions. Whole leaf specimens were collected, rolled and placed in a five-inch screw-top test tube.

## AMBIENT AIR SAMPLES

Ambient air samples were collected under dry weather conditions. A battery-operated personal monitor (DuPont Model T-4000/Standard 37 mm Millipore Cartridge) was operated within the survey vehicle with the membrane filter sampling head mounted outside and next to the rear window (on the passenger side). The air quality thus produced represented airborne dust induced by vehicular traffic. One such sample was collected within the Gouverneur-Edwards-Balmat district and comparison sample was collected outside the study area.

PRODUCT SAMPLES

Product samples were intended to represent end uses of talc and limestone minerals which are distributed to the public or available to other industries for manufacturing consumer products such as paints, abrasives and ceramics. Limestone materials are graded into powder and granular sizes for agricultural or grading use. Chip limestone may be purchased for use as a landscape material. These limestone materials are commonly found in the marketplace. Raw talc materials were difficult to obtain and were not requested from the company(s).

Limestone product samples were obtained from commercially available bags (50 lbs.) for each grade or by sampling from broken bags at the point of sale. The amount required was approximately one cubic inch and was placed in a scintillation container.

WATER AND STREAM SEDIMENT SAMPLES

Water samples collected from free-flowing streams, pond or lake water represent the potential for release of asbestiform minerals from waste tailing areas. Samples were collected upstream and downstream of the tailing waste areas. Similarly, a sample was collected from a lake suspected of receiving water containing such waste. Water samples were collected in one liter plastic containers and preserved with mercuric chloride to reduce biological growth. At each stream sample location, a stream sediment specimen was also collected and placed in a scintillation bottle. Approximately one cubic inch of sample was collected from the top one inch layer of stream bed.

DISCUSSION OF RESULTS OF ENVIRONMENTAL SAMPLE ANALYSIS

A summary of information describing all samples collected, the methods used for analysis, and the results of the analyses are shown in Tables 1-7. In some cases, more than one method of sample preparation and/or microscopical analysis was performed. The primary objective in analysis was to determine qualitatively the presence or absence of asbestiform materials and to assess the sample material as a potential source of environmental asbestos.

Maps indicating the geographical distribution for each type of sample collected in the Gouverneur-Edwards-Balmat study area are provided in the Appendix of this report.

TAILING WASTE SAMPLES

Tailing Waste Samples (Table 1, Samples C-1, D-1, E-1, F-1, G-1) which were collected June 12 and 13, 1984 were analyzed for asbestos by polarized-light microscopy with dispersion staining (PLM-DS). Subsamples were mounted in 1.605 refractive-index liquid and examined at 63 x magnification. Mineral fragments in random fields which were directly under points of a Whipple disk were counted as fibrous (aspect ratio >3 with parallel sides) or non-fibrous until at least 400 mineral points were counted. Refractive indices (> or $\leq$ 1.605) were determined for all but the smallest fibers by dispersion-staining colors or by Becke line movement. Fibers with refractive indices >1.605 were considered tremolite whereas fibers with refractive indices $\leq$ 1.605 were considered anthophyllite.

Tailing Waste Samples (Table 1) and rock samples (Also Table 1 and denoted by the prefix "S") were ground with a mortar and pestle and then separated into coarse and fine fractions with a 100-mesh sieve. Similar comminution methods have been used by Germine and Puffer (1981) in a study of asbestos-bearing rocks in New Jersey and by Puffer et al (1980) in studying asbestos distribution in Maryland and Pennsylvania. Siegrist and Wylie (1980) also analyzed milled or ground asbestos in their characterization of asbestos particle shapes. Analysis of the fine fraction allowed examination of the portion most likely to become airborne and also allowed maintenance of optimal optical conditions with the light microscope. Subsamples were mounted on microscope slides and points were counted. In light of the current controversy about the applicability of the term "asbestos" to certain amphibole types, an additional category, "acicular," was added between the categories "fiber" and "non-fiber." Acicular was defined as exceeding an aspect ratio of three but having nonparallel sides and/or having ends which were neither flat nor frayed. Two samples with an abundance of fibers/acicular fragments were analyzed further by scanning electron microscopy and energy-dispersive x-ray spectroscopy.

TABLE 1. ST. LAWRENCE COUNTY STUDY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS
SAMPLE COLLECTION PERIOD: JUNE 12, 13, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | MAP NO. 1 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION |
|---|---|---|---|---|
| Tailing Waste Samples | C-1 | 8 | Roadside material on Fuller-ville-Balmat Rd, approximately 1 1/2 miles east of Balmat where turnpike creek crosses road. | Contained one fiber (<1.605) o 0.25% by volume. Method: PLM |
| | D-1 | 9 | Roadside material on Sylvia Lake Rd, directly across from road leading to main mill of St. Joe Zinc. | Fibers were not detected Method: PLM-DS |
| | E-1 | 10 | Tailings, abandoned mine area near Talcville Road | Contained one fiber (<1.605) or 0.25% by volume. Method: PLM-DS |
| | F-1 | 11 | Tailings, area that was Mud Pond off Sylvia Lake Road | Fibers were not detected Method: PLM-DS |
| | G-1+ | 12 | Tailings, main tailings area, across 812 east of GTC Mill | 1st Subsample: 37 fibers (9.2% were counted. Most had a refractive index ≤1.605. Method: PLM-DS<br><br>2nd Subsample: Large number of fibers with aspect ratios >10. Confirmed to be anthophyllite l electron diffraction patterns. No talc diffraction patterns were obtained from these fiber: Method: TEM<br><br>3rd Subsample: All fibers analyzed by energy-dispersive x-ray analysis yielded only Mg and Si; peaks consistent with anthophyllite composition. Method: Mounted on carbon planc and examined by SEM |

+Subsequently re-analyzed after grinding with no effect on aspect ratio of fibers.
Results of Analyses: Fibrous - 10.0%
Non-Fibrous Acicular - 13.5%
Non-Fibrous - 76.5%

TABLE 1. ST. LAWRENCE COUNTY STUDY (Continuation)
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS
SAMPLE COLLECTION PERIOD: JUNE 12, 13, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | MAP NO. 1 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION* | | |
|---|---|---|---|---|---|---|
| | | | | Fibrous | Acicular | Nonfibro |
| Tailing Waste Samples | S84-1 | 1 | Tailing sample from abandoned mine half mile north of Natural Bridge along Indian River | 0.3% | 3.2% | 96.5% |
| | S84-2 | 2 | Roadside rock sample near GTC (Rte 3 & east Lake Bonaparte Road) fragments from blasting | 32.0% | 36.5% | 31.5% |
| | S84-3 | 3 | Split of sample S84-2** | 36.5% | 44.5% | 19.0% |
| | S84-4 | 4 | Bottom of Edward tailing pond surface-lower elevation | 0.0 | 1.3% | 98.7% |
| | S84-5 | 5 | Ant hill sand from cover on tailings pond at Edwards (upper elevation) | 0.3% | 1.2% | 98.5% |
| | S84-6 | 6 | Scrapping from vein in white boulder that had been placed to block Quarry Road-southwest Governeur | 0.0% | 0.3% | 99.7% |
| | S84-7 | 7 | Pile of marble chips outside crushing mill southwest corner of governeur (powdered material in void of chips) | 0.0% | 0.5% | 99.5% |

*Except as noted, all samples analyzed by PLM-DS.
?rimarily wollastinite ore, analyzed by PLM-DS, SEM-EDS;TEM-CBED.

Fibers were not detected in samples D-1 and F-1. Samples C-1 and E-1 contained one fiber (<1.605) or 0.25% by volume. Thirty-seven fibers (9.2%) were counted in sample G-1. Most of these had refractive indices ≤ 1.605.

A second subsample from G-1 was mounted on a transmission electron microscope (TEM) grid and analyzed by TEM. A large number of fibers were seen and had aspect ratios >> 10. Electron diffraction patterns revealed these to be anthophyllite, which is consistent with the refractive indices seen earlier. No talc diffraction patterns were obtained from these fibers.

A third subsample from G-1 was mounted on a carbon planchet for scanning electron microscopical examination. Representative electron micrographs of the sample were taken as a matter of record. All of the fibers analyzed by energy-dispersive x-ray spectroscopy (EDXRS) yielded only magnesium and silicon peaks, consistent with anthophyllite composition.

Samples S84-2 and 3 were difficult to analyze because of the abundance of fiber-like fragments. One analyst counted 25% as fibers and 10% as acicular whereas the other analyst reversed the ratio as 10% and 32%. The refractive index of most fibers was 1.63 which meant that these were not anthophyllite (amphibole) or talc. These were later identified as wollastonite. Scanning electron micrographs confirmed that differentiating fibrous and acicular fragments in these samples was difficult. X-ray spectra collected from these two samples revealed large calcium and silicon components consistent with wollastonite.

Throughout the Gouverneur-Balmat-Edwards Mining District, white granular sand and gravel-like materials have been used as roadside bedding, parking lot and driveway surfacing. Materials similar in appearance may be found at various mine tailing waste disposal areas in Edwards (abandoned), Talcville (abandoned), Natural Bridge (Lewis County-abandoned), Fowler (Mud Pond), Gouverneur (abandoned crushing mill), and at the currently active mining operation at Balmat. The results of analyses for samples selected from these areas (Table 1) show that fibrous asbestos minerals were not abundant in deposits of formerly mined areas.

Tailing waste from an actively mined area at Balmat (east of the GTC mill on Route 812) represented by sample G-1 indicated the presence of fibrous anthophyllite. Similarly, fibrous and acicular materials were found to be more extensively present for samples S84-2 and S84-3, associated with the currently active wollastonite mining operation near Lake Bonaparte.

ROCK SAMPLES

Samples AB-1, AB-2 and AB-3 identified in Table 2 were examined by stereobinocular microscope. Only AB-3, a large rock of loose, platy make-up, had numerous fibrous protrusions. Analysis by PLM-DS revealed these to be vegetative fibers, probably lichen or moss. Mineral non-fibrous tremolite and talc minerals were also present in sample AB-3 which was collected within the active tailings area of the GTC mining operation at Balmat.

TABLE 2
ST. LAWRENCE COUNTY STUDY

RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSES
SAMPLE COLLECTION PERIOD: JUNE 12, 13, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | MAP NO. 2 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION |
|---|---|---|---|---|
| Rock Samples | AB-1 | 1 | St. Joe Roadside, Behind Building | Fibers were not observed. Tremolit present. Method: Stereo Binocular Examination |
| | AB-2 | 2 | Roadside Fullerville/ Balmat Road | Fibers were not observed Method: Stereo Binocular Microscopi Examination |
| | AB-3 | 3 | Within GTC tailings area, Route 812 | Tremolite/Talc present. Numerous fibrous protrusions, loose platy consistency Method: Stereo Binocular Microscopi Examination. Found to be vegetativ fibers (lichen or moss) |

STREAM WATER AND SEDIMENT SAMPLES

To determine if asbestos or talc minerals have or were being discharged to adjacent streams, two downstream sediment samples were collected from Turnpike Creek on the north side of Route 58 and upstream from that location at a well-defined beaver dam located approximately 2000 feet from the tailing waste area in Balmat. These samples, designated as A-1 and B-1 in Table 3, were dried in an oven at 50°C and then analyzed by PLM-DS using a point counting method. The two fibers (refraction index less than 1.605) counted in sample A-1 represents 0.5% of the minerals. Three fibers were counted in B-1, but these were isotropic and therefore non-asbestos mineral.

Water samples A, B and C were prepared for polarized-light microscopy by centrifuging 50 ml of each and examining the residue in a Sedgewick-Rafter counting cell at 63x magnification. Sample A contained little residue and sample C contained some organic detritus but no minerals. Sample B had the most residue, much of which was organic. A few platy minerals were seen but no fibers were detected. These samples were not suitable for analysis by TEM because preservative was not added at the time of collection.

TABLE 3
ST. LAWRENCE COUNTY STUDY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS
SAMPLE COLLECTION PERIOD: JUNE 12, 13, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | MAP NO. 3 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION |
|---|---|---|---|---|
| Stream Sediment | A-1 | A-1 | Downstream from main tailings area on Route 812 East of GTC mill #1, in Turnpike Creek, on the Northside of Route 58, approximately one mile from tailings. | Two fibers counted (<1.605) 0.5% of the minerals. Method: Dried in oven at 50°C. PLM-DS using point-counting method |
| | B-1 | B-1 | Downstream from main tailings area on Route 812 East of GTC mill #1, in outlet from Beaver Pond, Eastside of railroad tracks, approximately 2000 feet from tailings. | Three fibers counted - reported as isotropic and therefore non-asbestos. Method: Dried in oven at 50°C. PLM-DS using point counting method |
| Water mples | A | Same as A-1 | Downstream from main tailings area on Route 812 East of GTC mill #1, in Turnpike Creek, on the Northside of Route 58, approximately 1 mile from Berm Outlet. | Contained little residue but no minerals Method: 50 ml centrifuged and ex amined in a sedgewick-rafter counting cell at 63 x Mag. PLM-D |
| | B | Same as B-1 | Downstream from main tailings area on Route 812 East of GTC mill #1, in outlet from Beaver Pond, Eastside of railroad tracks, approximately 2000 ft. from Berm Outlet | Contained organic residue. A fe platy materials observed but nor fibrous. Method: 50 ml centrifuged and ex amined in a Sedgewick-Rafter counting cell at 63 x mag. PLM-D |
| | C | C | Upstream from main tailings area on Route 812 East of GTC mill #1, in Turnpike Creek, on the Northside of Fuller-ville-Balmat Rd. approximately 4000 feet from inlet to tailings pond. | Contained some organic detritus but no minerals. Method: 50 ml centrifuged and ex amined in a Sedgewick-Rafter counting cell at 63 x mag. PLM-D |

PLM-DS - Polarized Light Microscopy with Dispersion Staining
TEM - Transmission Electron Microscopy
SEM - Scanning Electron Microscopy

TABLE 3 (Continuation)

ST. LAWRENCE COUNTY STUDY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS
SAMPLE COLLECTION PERIOD: JULY 10, 12, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | MAP NO. 4 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION* |
|---|---|---|---|---|
| Water Samples | W8401SL | 1 | At culvert under 58 300 ft. SE (Downstream) | Asbestos - not detected<br>Detection limit 2.4 million fit per liter (MFL)<br>Method: TEM with microbeam diffraction |
| | W8402SL | 2 | Turnkpike Creek under Route 58 culvert 100 ft SE of railroad in Fowler (Downstream) | Chrysotile detected - 7.2 MFL<br>Amphibole Total - 9.6 MFL<br>Detection limit - 2.4 MFL<br>Method: TEM with microbeam diffraction |
| | W843SL | 3 | Downtown Fowler; culvert under old Route 58 (Downstream) | Chrysotile detected - 4.8 MFL<br>Amphibole Total - 0.0 MFL<br>Detection limit - 2.4 MFL<br>Method: TEM with microbeam diffraction |
| | W844SL | 4 | Turnpike Creek under Fullerville road (Upstream) | Asbestos - Not detected<br>Detection 2.4 MFL<br>Method: TEM with microbeam diffraction |
| | W845SL | 5 | Sylvia Lake Northwest Shore | Chrysotile - Not detected<br>Amphibole Total - 2.4 MFL<br>Detection limit - 2.4 MFL<br>Method: TEM with microbeam diffraction |

PLM-DS - Polarized Light Microscopy with Dispersion Staining
TEM - Transmission Electron Microscopy
SEM - Scanning Electron Microscopy

Water samples collected from five sites within the study area were analyzed for asbestos by transmission electron microscopy with microbeam diffraction. The site descriptions are given in Table 3. Asbestos was not detected in the laboratory blank sample or in samples W8401SL or W844SL. A maximum fiber concentration of 16.8 million fibers per liter (MFL) was found in a sample (Sample W8402SL) of Turnpike Creek water directly downstream from the active mine tailing waste area on Route 812 in Fowler. In comparison, asbestos minerals were not identified in a Turnpike Creek sample (W844SL) collected upstream from the disposal area. Two samples (W8401SL and W843SL) represent water collected from a tributary of Turnpike Creek, but downstream of the active mine area. The head water sampled of this tributary is located due east of the active mining area. One sample (W843SL) contained 4.8 MFL of chrysotile asbestos fibers with the absence of amphibole minerals. Amphibole fiber types could not be determined on the TEM, which lacked EDXRS. The relative abundance of chrysotile may be attributed to a) its presence in some rock strata in the area, b) its ubiquitous use and/or c) its smaller aerodynamic diameter relative to amphiboles. The small concentration of amphibole fibers near the active tailings area may be attributable to water conditions at the time of sampling; low flow in the streams probably maximized sedimentation. Collecting water samples from these streams under turbulent conditions would probably yield a better cross section of mineral types in the watershed. Likewise, collecting a sample from Sylvia Lake either before thermal stratification in the spring or after thermal destratification in the autumn would be most likely to yield microparticles normally located on or near the bottom.

SOIL SAMPLES

Because surface soils may be strongly associated with local bedrock formations, soil samples were collected throughout the study area. Samples collected were prepared in a procedure similar to that used for rock specimens outlined on page 10. The analysis of these samples (Table 4) showed an absence of any asbestos minerals. Both fibrous and acicular morphological forms present were related to vegetation.

TABLE 4

ST. LAWRENCE COUNTY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS
SAMPLE COLLECTION PERIOD: AUGUST 6, 7, 1983

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | MAP NO. 5 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION COMPOSITION BY VOLUME | | |
|---|---|---|---|---|---|---|
| | | | | Fibrous | Acicular | Nonfibr |
| Soil Samples | S84-9 | 1 | North of Edwards on DEC Forest Land access road two miles north of Edwards High School Trout Lake Road | 2.2%+ | 0.5% | 97.3 |
| | S84-18 | 2 | Southwest of Edwards off Talcville Road 100 yards off Route 58 before river | | | 100.0 |
| | S84-10 | 3 | Southwest of Edwards off Route 58 on Talcville Road 100 yards from intersection-soil sample eastside Talcville Road (Tree across road-vegetative sample). | 2.0%+ | 1.3% | 96.7 |
| | S84-19 | 4 | Fullerville to Harrisville Road - 0.5 miles east of Fullerville (represents Fullerville Sands on dirt road. | | | 100.0 |
| | S84-20 | 5 | Balmat/Fullerville Road 1.1 miles west of Fullerville Church Northside | | | 100.0 |
| | S84-11 | 3.6 | Intersection of Sylvia Lake Road and Route 812 Southwest side. | 2.2%+ | 1.5% | 96.3 |
| | S84-21 | 3.7 | Off Route 58, northside dirt road due west of GTC plant, two and three-quarter mile west of Fowler intersection of Routes 58 and 812. | | 4.0% | 96.0 |
| | S84-12 | 3.8 | One-quarter mile on Chubb Lake Road west from intersection of Talcville. | 2.2%+ | 1.8% | 96.0 |

(Continuation Table 4)

| | | | Fibrous | Acicular | Nonfibr |
|---|---|---|---|---|---|
| S84-22 - | 9 | Fairgrounds - Village of Gouverneur next to high school | 0.5%+ | 0.5% | 99.( |
| | 10 | 2.7 miles northeast of intersection of Route 11 and Settlement Road on Hermon Road 1/4 mile westside | 2.5%+ | 0.0%+ | 97.5% |

+Vegetation fibers only.

VEGETATION SAMPLES

There are no established standard procedures for evaluating dust deposition on various surfaces either indoors or outdoors. The presence of asbestiform minerals on surfaces could only be interpreted qualitatively as an index of distribution of the variety of asbestiform minerals within the study area. While chrysotile fibers are commonly found in outdoor ambient air, the possibility of identifying fibrous anthophyllite in tailing waste samples of the active mining operations at Balmat suggested that this mineral could be used as an index of dust distribution throughout the area. Leaf specimens from vegetation throughout the study area were collected to represent depositional surfaces, particularly roadside locations where dusting was evident due to vehicular traffic. Other leaf samples were collected in more remote areas for comparison purposes.

Vegetation samples, denoted by "V" in Table 5, were prepared for examination in the laboratory by dessication under vacuum and subsequent low temperature ashing. The residue was suspended in refractive index liquid ($n_d$=1.605) or subsamples were removed from dry residue by the method used for soil samples. Subsamples obtained by both preparation procedures were examined by the point-counting PLM-DS method recommended by the EPA for analysis of asbestos in bulk samples.

Based upon these procedures, only vegetation fibers were observed. These samples were difficult to analyze because of the large amounts of carbon and partially ashed residue.

Due to the early recognition of the inadequacy of these procedures, leaf samples designated 4.1 to 4.8 as in Table 5 were not examined.

PRODUCT SAMPLES

Three product samples were analyzed for the presence of asbestos minerals. Basins, Inc., a company in Balmat, produces various grades of limestone products primarily for agricultural purposes. Sample S84-8 was collected directly from a bag of powdered limestone at an Agway store in DeKalb Junction. A second sample of crushed aggregate reported to be taken from the Basins, Inc. limestone source in Fowler, was collected from a driveway area on Sylvia Lake Road.

Both samples were examined by PLM-DS and no asbestiform minerals were identified in these products.

A third sample, NYTAL 200, a Governeur Talc Company product submitted by USEPA to this department, showed the presence of non-fibrous and short fibered tremolite with short and long fibered anthophyllite.

TABLE 5

ST. LAWRENCE COUNTY STUDY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS
SAMPLE COLLECTION PERIOD: AUGUST 6, 7, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | IDENTIFICATION CODE MAP NO. 5 | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION Fibrous | Acicular | Nonfibr |
|---|---|---|---|---|---|---|
| Hardwood Tree Foliage Leaf Samples | | 4.1 | Edwards High School Grounds | Not Examined | | Note: Not Designa on Maps |
| | | 4.2 | Talcville(V) Across from abandoned houses | Not Examined | | |
| | | 4.4 | Balmat - abandoned School | Not Examined | | |
| | | 4.5 | Fowler School | Not Examined | | |
| | | 4.6 | Hailsboro Cemetary | Not Examined | | |
| | | 4.7 | Gouverneur Fairgrounds | Not Examined | | |
| getation Samples | V84-3 | 1 | Southwest of Edward off Route 58 on Talcville Road 100 yards from intersection sample westside Talcville Road. | 10.0%+ | 3.0% | 87.0% |
| | V84-4 | 2 | Fullerville to Harrisville Road 0.5 miles east of Fullerville (represents Fullerville Sands) on dirt road. | 4.5%+ | 1.0%+ | 94.5% |
| | V84-6 | 3 | Intersection of Sylvia Lake Road and Route 812 southwest side. | 22.5%+ | 0.5%+ | 77.0% |
| | V84-12 | 4 | On Smalls Flat Road one-quarter mile west in intersection of Smalls Road and Elm Grove Road. | 1.0%+ | 12.0%+ | 87.0% |

+Vegetation fibers only.

TABLE 6

ST. LAWRENCE COUNTY STUDY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSES
SAMPLE COLLECTION PERIOD: AUGUST 6, 7, 1985

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | FIELD NO. | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION Fibrous | Acicular | Nonfibrous |
|---|---|---|---|---|---|---|
| Product Sample | S84-8 | S84-8 | Basins Agr. white limestone (five) from bag at Agway in DeKalb Junction | 0.0 | 0.0 | 100.0% |
| | S84-16 | 7.1 | Sylvia Lake Road - Camp Driveway Limestone aggregate-Basins, Inc. | 0.0 | 0.5% | 99.5% |
| | S84-24 | S84-24 | NYTAL++ - GTC Product | ≤1.605-13%<br>>1.605-3.5%<br>Undetermined 1.0% | 13.5% | 69.0% |

++ Talc product submitted by USEPA (No. 67708)
Nonfibrous minerals are primarily tremolite with some quartz.
Short fibered minerals are tremolite and anthophyllite.
Long fibered minerals are primarily anthophyllite, with approximately 5-10% exceeding an aspect ratio of 10.

AMBIENT AIR SAMPLES

An ambient air sample was collected during the course of inspection of various sites within the study area. The sample was collected by the method previously described. The purpose of this sample was to establish average baseline concentrations of airborne fibrous asbestos minerals within the study area. It was recognized that the sample could be easily influenced by dusting conditions created by the moving vehicle. A similar sample was collected for comparison to represent a baseline of ambient air quality outside the Phase I study area.

The results of analysis of these samples are shown in Table 7. Analysis were performed by both optical and transmission electron microscopy. The total fiber concentration by either type of analysis was found to be measurably higher for the study area than in outlying areas. Analysis by electron microscopy indicated that both chrysotile and amphibole fibers were found with the former being more prevalent. The higher mass concentration in M84-1 was influenced by a single amphibole fiber whose mass comprised 97% of the total asbestos mass. If deleted, the total mass would be less than 1.0 ng/$m^3$.

CONCLUSIONS:

This limited investigation did not indicate an extensive distribution of fibrous asbestos minerals in the Gouverneur-Balmat-Edwards area. The asbestos minerals, tremolite, actinolite and anthophyllite were absent in samples of discontinued mine tailing waste disposal areas and materials used in roadside bedding, residential driveways and parking areas. The materials found in these areas are of recent origin assumed to be taken from unidentified local mining operations.

Similarly, soil sample analyses did not identify the presence of any asbestos minerals. This finding suggests little concern for airborne asbestos due to dusting during cultivation of agricultural soils. Vegetation leaf samples examined for airborne particulates did not have inorganic mineral fibers deposited on their surfaces. However, analytical difficulties with this novel procedure limit its usefulness for drawing conclusions.

Two of three rock samples examined and collected in the Balmat area showed tremolite and talc minerals to be present, but none contained fibers. One sample collected from the tailing waste area close to the active mining site at Balmat (east of the Gouverneur Talc Company Mill on Route 812) contained fibrous anthophyllite. Fibrous and acicular materials were found to be more extensively present in rock specimens associated with the currently active wollastonite mining operation near Lake Bonaparte. The extent to which these and other mining operations in the study area may contribute to a wider environmental or geographical distribution of airborne fibrous minerals is uncertain but it is not believed to be extensive.

Sediment samples and water samples were collected from streams in the proximity of active mining and tailing waste areas in Balmat. The concentrations were not inconsistent with those found in other surface water streams due to naturally occurring geological contributions.

Samples of limestone products produced by a local company (Basins, Inc.) did not contain asbestos minerals. A sample of one product (Nytal 200) submitted by the USEPA and reported to have been produced by the Gouverneur Talc Company showed the presence of both non-fibrous and short fibered tremolite and short and long fibered anthophyllite.

One outdoor ambient air sample collected within the Gouverneur-Balmat-Edwards area was compared to a sample collected in a similar manner, but remote from the study area. Examination of these samples by transmission electron microscopy indicated fiber concentrations measurably higher for the study area, but not significantly higher than expected in outdoor ambient air on the basis of published data from other areas.

TABLE 7

ST. LAWRENCE COUNTY STUDY
RESULTS OF ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSES
SAMPLE COLLECTION PERIOD: JULY 10-12, 1984

| SAMPLE TYPE | IDENTIFICATION CODE LAB NO. | FIELD NO. | SAMPLE LOCATION DESCRIPTION | METHODS AND RESULTS OF MICROSCOPICAL EXAMINATION |
|---|---|---|---|---|
| Ambient Air Samples | M84-1 | M84-1 | Sample collected in transit Vicinity Balmat to Talcville and Edwards, NY | NIOSH Optical: 0.020 f/cc<br>TEM: 0.116 f/cc, 17.7 ng/$m^3$ |
| | M84-2 | M84-2 | Sample collected in transit DeKalb Junction to Ogdensburg to Pierrepont, NY (Outside Study Area) | NIOSH Optical: 0.020 f/cc<br>TEM: 0.064 f/cc, 0.78 ng/$m^3$ |

APPENDIX A

ENVIRONMENTAL SAMPLE LOCATIONS

MAP 1 TAILING WASTE

MAP 2 ROCK SPECIMENS

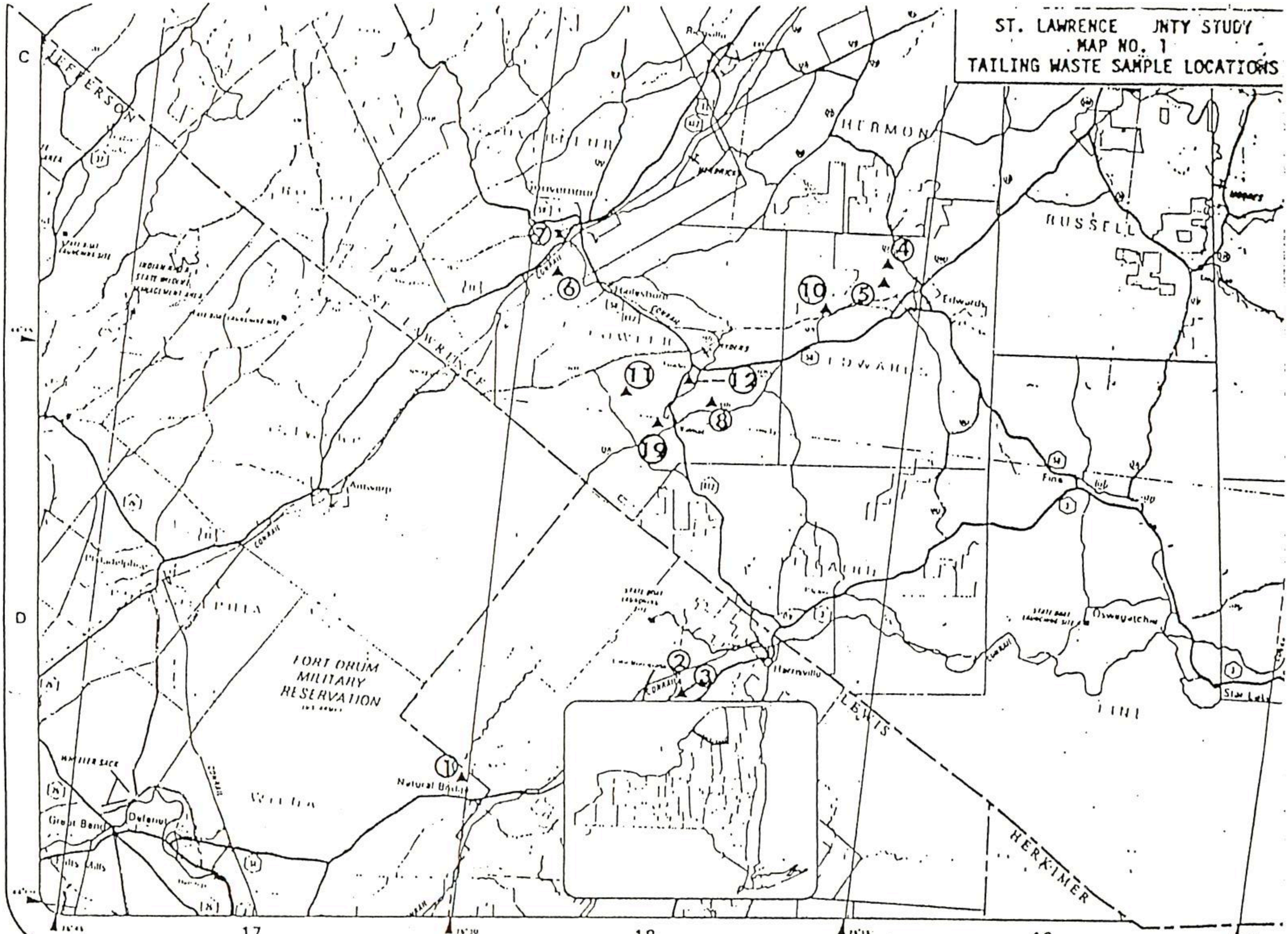
MAP 3 STREAM SEDIMENTS

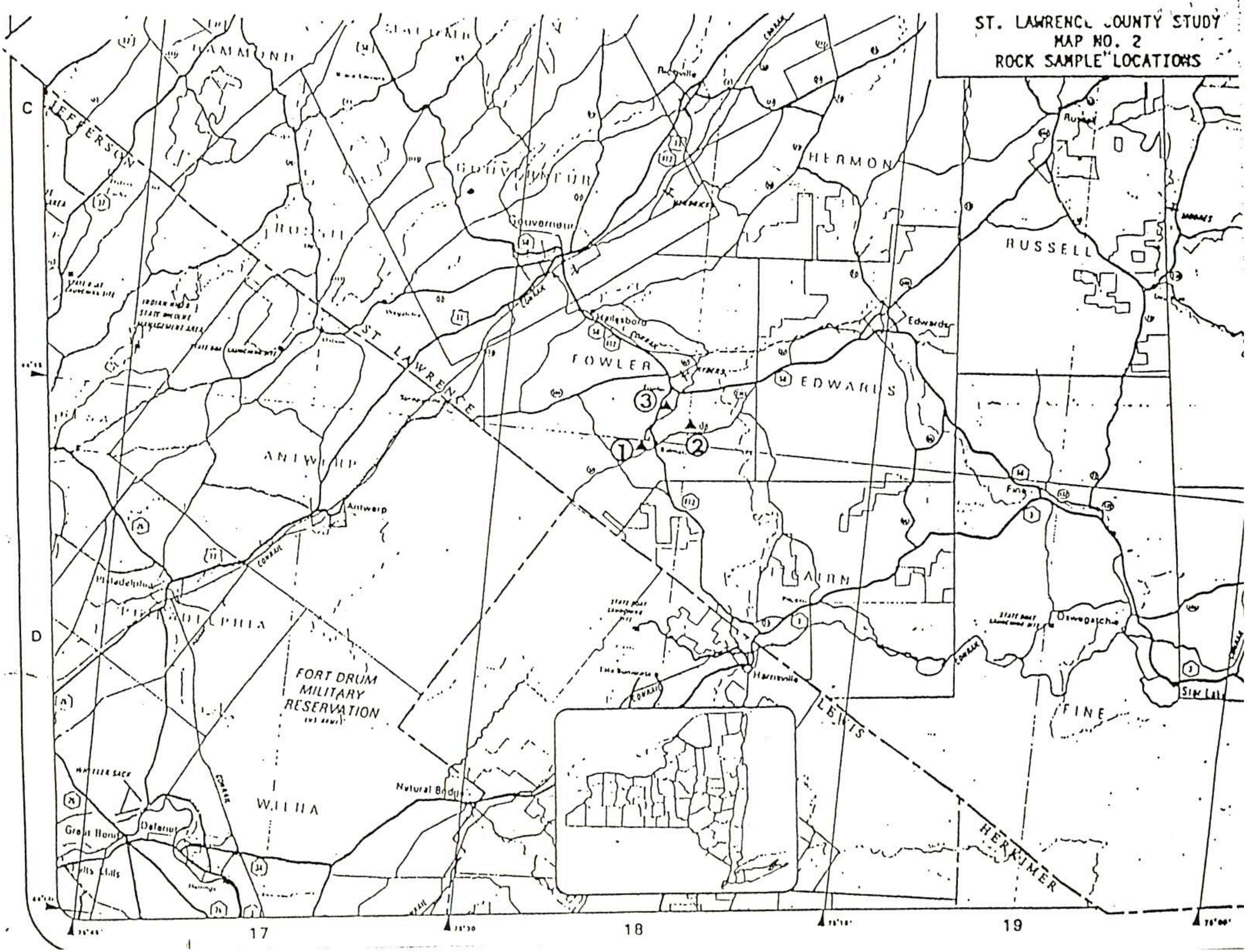
MAP 4 WATER

MAP 5 SOILS

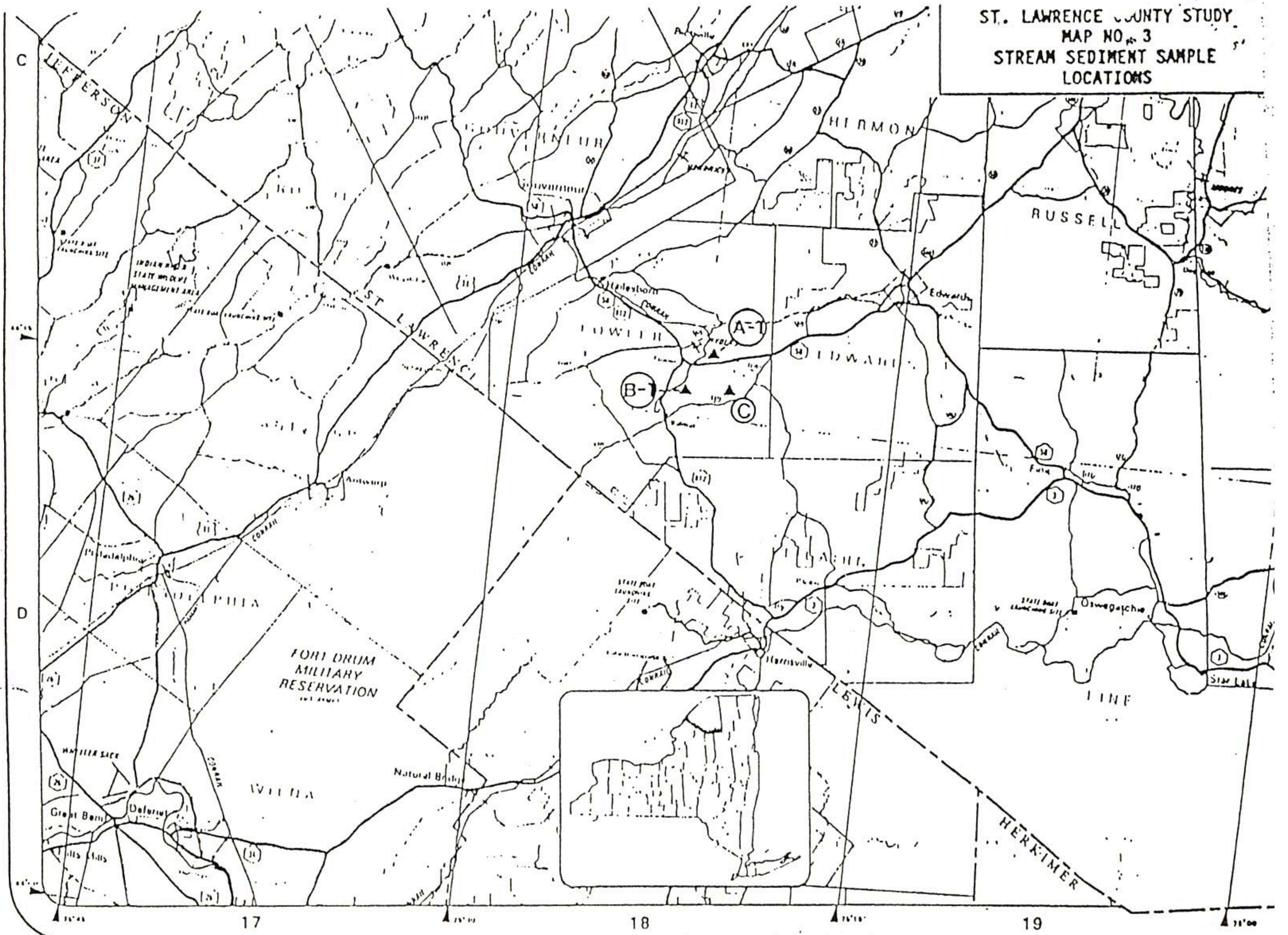
MAP 6 VEGETATION

MAP 7 OBSERVED MINE, MILL AND QUARRY LOCATIONS

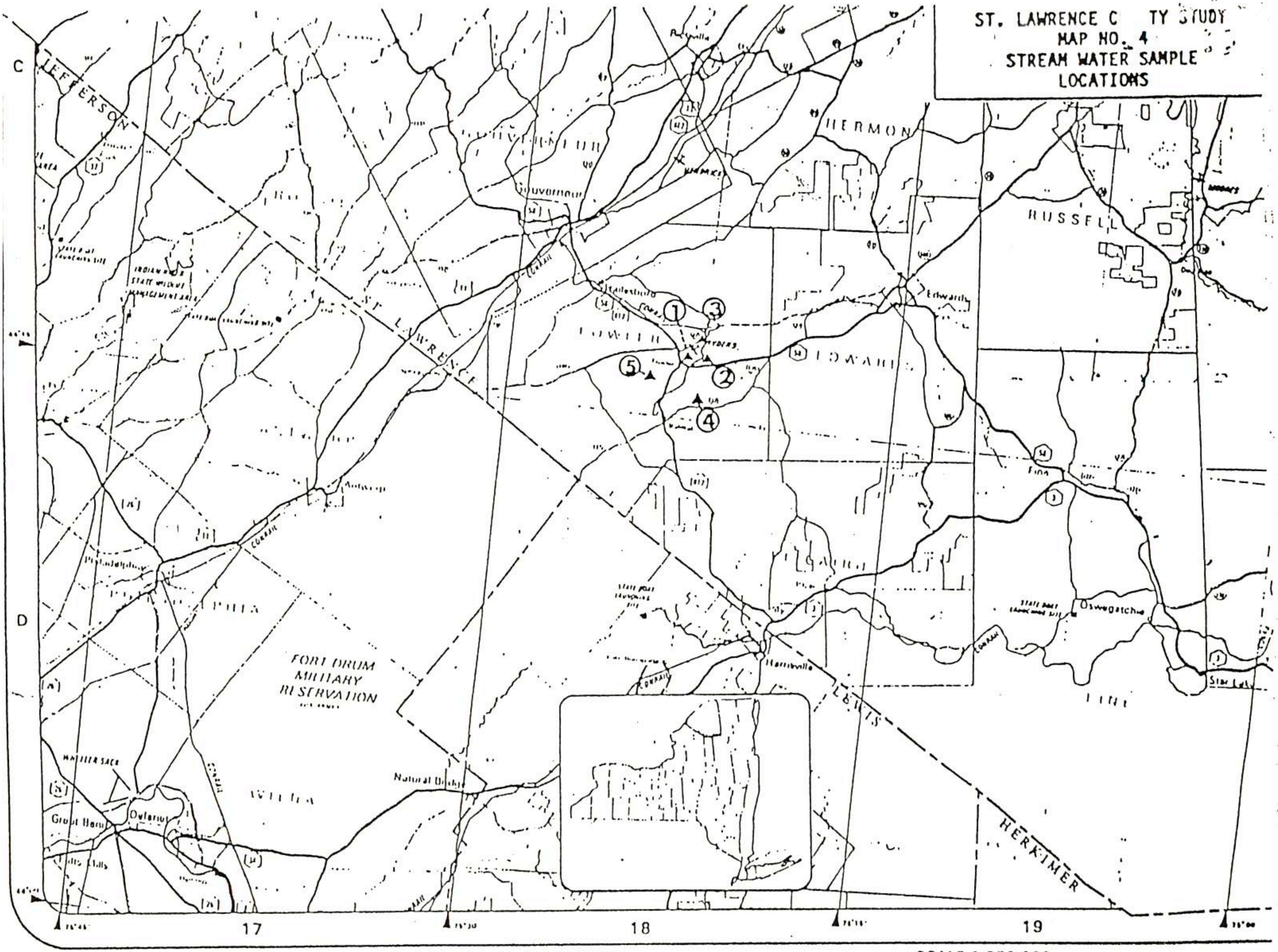

ST. LAWRENCE JNTY STUDY
MAP NO. 1
TAILING WASTE SAMPLE LOCATIONS
JEFFERSON
HERMON
RUSSELL
EDWARDS
ST LAWRENCE
LEWIS
HERKIMER
FORT DRUM
MILITARY
RESERVATION
Edwards
Fine
Star Lake
Oswegatchie
Harrisville
Natural Bridge
Antwerp
Philadelphia
Great Bend
Felts Mills
C
D
17
18
19
1
2
3
4
5
6
7
8
10
11
12
19
SCALE 1:250,000
5
0
5 MILES


ST. LAWRENCE COUNTY STUDY
MAP NO. 2
ROCK SAMPLE LOCATIONS
HAMMOND
HERMON
RUSSELL
Russell
GOUVERNEUR
Gouverneur
Edwards
EDWARDS
FOWLER
Hailesboro
ST LAWRENCE
JEFFERSON
ANTWERP
Antwerp
Philadelphia
Fine
FINE
Oswegatchie
Harrisville
LEWIS
HERKIMER
FORT DRUM
MILITARY
RESERVATION
Natural Bridge
WILNA
Great Bend
Deferiet
1
2
3
C
D
17
18
19

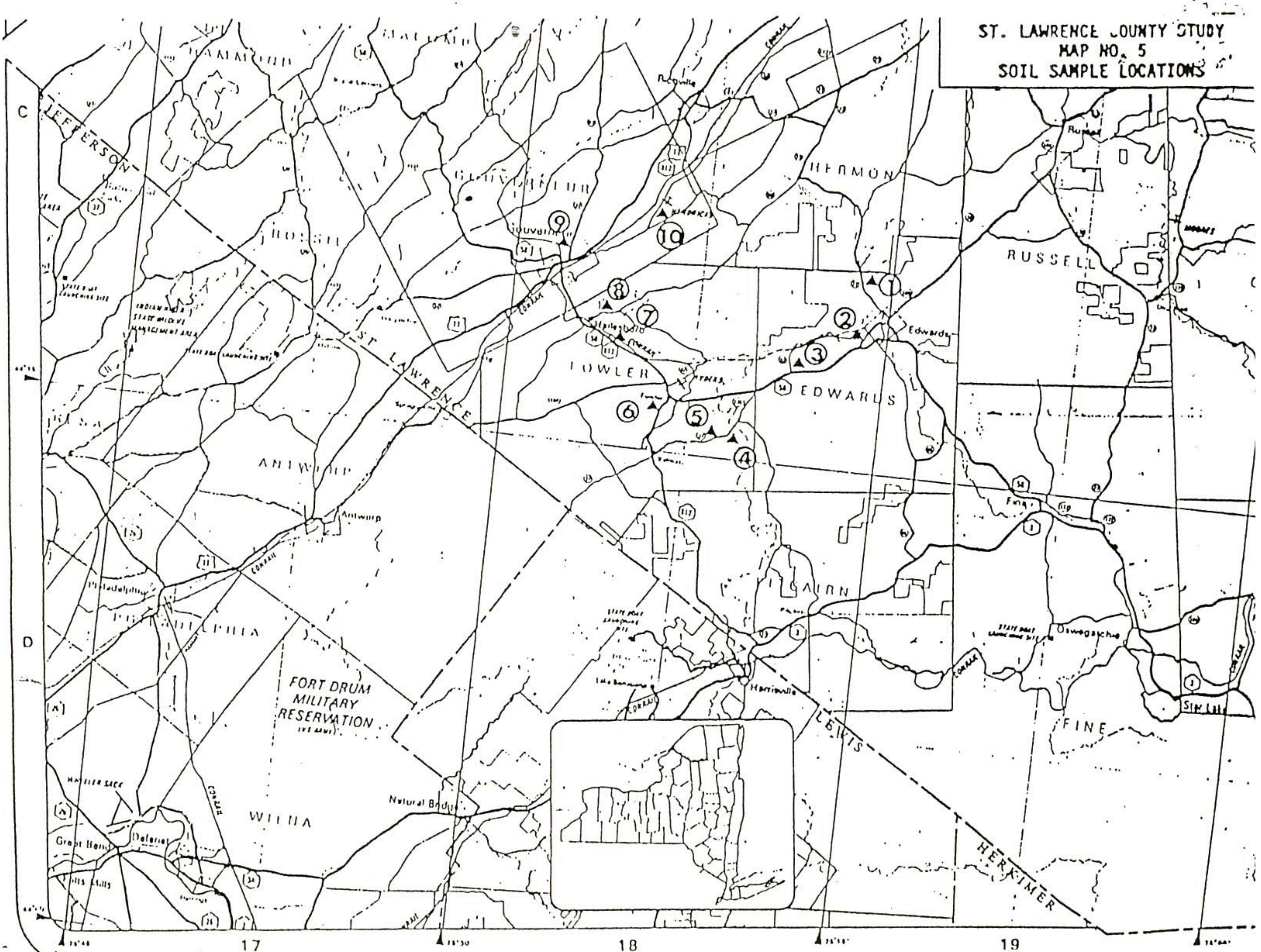
# ST. LAWRENCE COUNTY STUDY
## MAP NO. 3
## STREAM SEDIMENT SAMPLE LOCATIONS



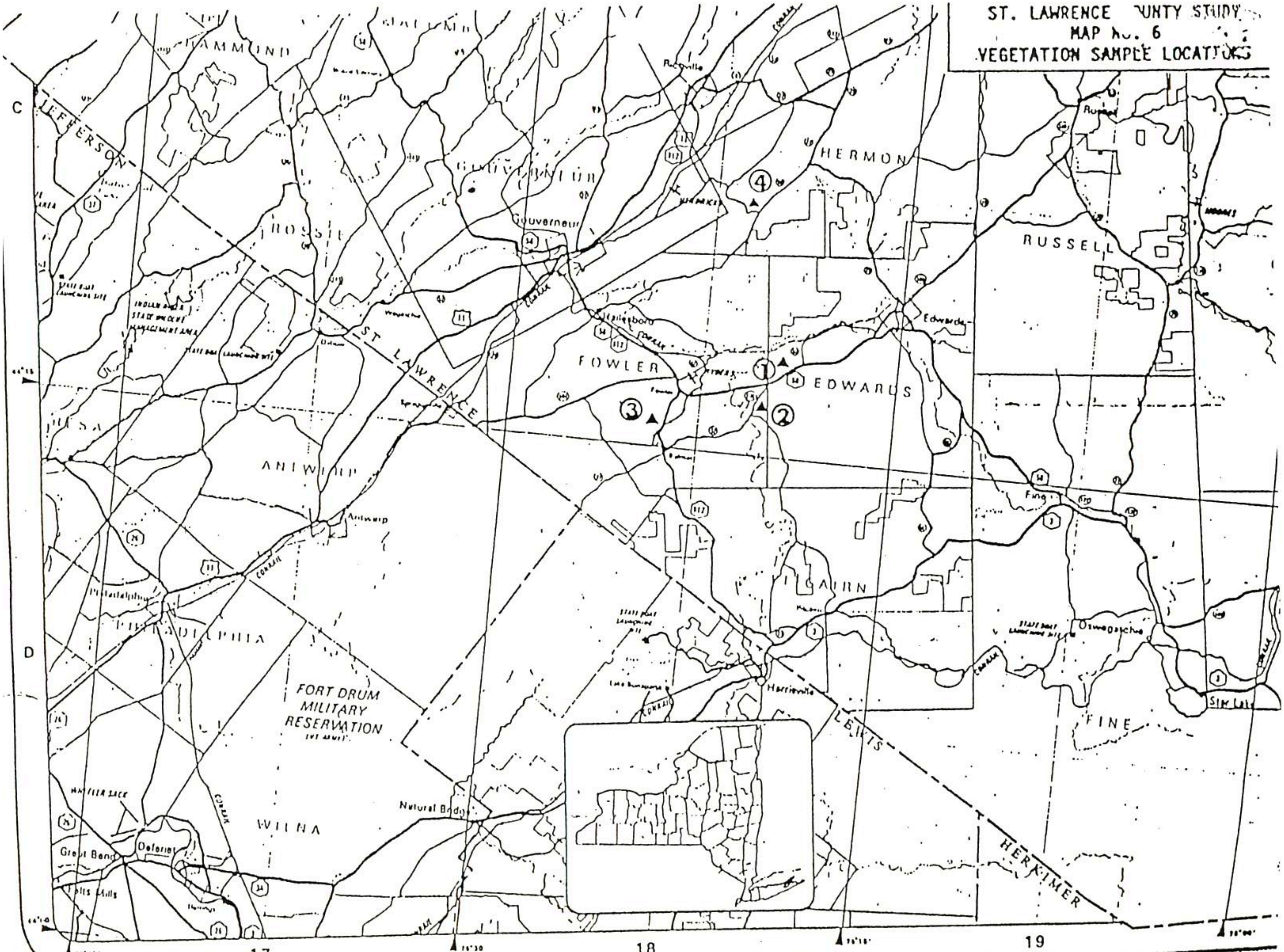
ST. LAWRENCE C TY STUDY
MAP NO. 4
STREAM WATER SAMPLE
LOCATIONS




SCALE 1:250,000


ST. LAWRENCE COUNTY STUDY
MAP NO. 5
SOIL SAMPLE LOCATIONS
JEFFERSON
ST LAWRENCE
LEWIS
HERKIMER
HERMON
RUSSELL
EDWARDS
FOWLER
ANTWERP
FINE
FORT DRUM
MILITARY
RESERVATION
WILNA
Edwards
Antwerp
Harrisville
Oswegatchie
Natural Bridge
Great Bend
Philadelphia
Fine
1
2
3
4
5
6
7
8
9
10
C
D
17
18
19

ST. LAWRENCE COUNTY STUDY
MAP NO. 6
VEGETATION SAMPLE LOCATIONS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

8 JUN 1988

Mr. Paul Vanderbilt
Director of Environmental
Affairs
R. T. Vanderbilt Company, Inc.
30 Winfield Street
Norwalk, Connecticut 06855

Dear Mr. Vanderbilt:

Thank you for your letter of May 12, 1988, regarding asbestos emissions from talc processing plants, which was in response to an Environmental Protection Agency request for information under Section 114 of the Clean Air Act.

This information will be most useful in assessing emissions from the processing of various mineral substances containing contaminant asbestos fibers. We appreciate the time you and your staff spent assembling and organizing the information.

Should you have any questions regarding this project, please contact me at (919) 541-5460.

Sincerely,

Bruce Moore

Bruce Moore
Industrial Studies Branch
Emission Standards Division

cc: Mr. Allan M. Harvey, Director of Environmental Affairs

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

8 JUN 1988

Mr. Fred Fox
Environmental Director
Homestake Mining Company
Post Office Box 875
Lead, South Dakota 57754

Dear Mr. Fox:

Thank you for your letter of May 20, 1988, regarding asbestos emissions from gold processing plants, which was in response to an Environmental Protection Agency request for information under Section 114 of the Clean Air Act.

This information will be most useful in assessing emissions from the processing of various mineral substances containing contaminant asbestos fibers. We appreciate the time you and your staff spent assembling and organizing the information.

Should you have any questions regarding this project, please contact me at (919) 541-5460.

Sincerely,

Bruce Moore

Bruce Moore
Industrial Studies Branch
Emission Standards Division

cc: Mr. Al Winters, President

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

8 JUN 1988

Mr. Ronald Bauer
Vice President
for Manufacturing
NYCO PMI Division
Post Office Box 368
Willsboro, New York 12996

Dear Mr. Bauer:

Thank you for your letter of May 10, 1988, regarding asbestos emissions from garnet processing plants, which was in response to an Environmental Protection Agency request for information under Section 114 of the Clean Air Act.

This information will be most useful in assessing emissions from the processing of various mineral substances containing contaminant asbestos fibers. We appreciate the time you and your staff spent assembling and organizing the information.

Should you have any questions regarding this project, please contact me at (919) 541-5460.

Sincerely,

Bruce Moore

Bruce Moore
Industrial Studies Branch
Emission Standards Division

cc: Mr. Jeffrey Kinblom, Production Manager

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

8 JUN 1988

Mr. Richard Zazenski
Vice President
Quality Assurance and
Product Safety
Cyprus Industrial Minerals Co.
Post Office Box 3299
Englewood, Colorado 80155

Dear Mr. Zazenski:

Thank you for your letter of May 18, 1988, regarding asbestos emissions from talc processing plants, which was in response to an Environmental Protection Agency request for information under Section 114 of the Clean Air Act.

This information will be most useful in assessing emissions from the processing of various mineral substances containing contaminant asbestos fibers. We appreciate the time you and your staff spent assembling and organizing the information.

Should you have any questions regarding this project, please contact me at (919) 541-5460.

Sincerely,

Bruce Moore

Bruce Moore
Industrial Studies Branch
Emission Standards Division

cc: Mr. Kenneth Barr, President

New York phone #'s:

NY Dept of Labor
518-457-2072
518-457-5971

NY State Dept of Health (Albany)
518-474-2121
518-474-5422

EPA (Region 2)
- Stationary Source Compliance Div
Ken Malmberg FTS: 382-2870

- N.Y. NESHAP
Bob Fitzpatrick FTS: 264-6770
Dennis Santella FTS: 264-8677
Karl Mangeles 264-6684
- Air Complaince
Ken Eng FTS: 264-9627

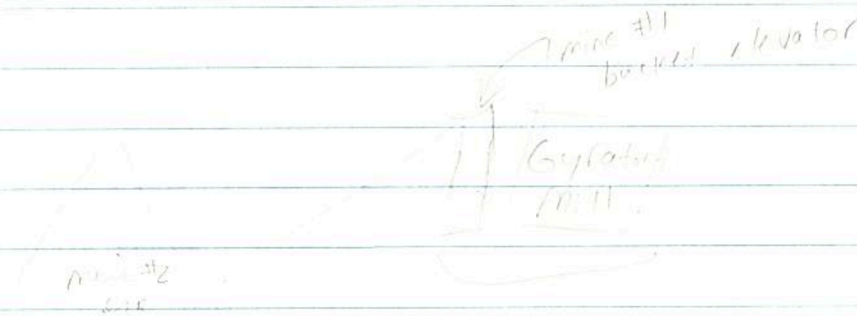
NY Bureau of Toxic Subst
518-458-6376

NY Bureau of Epidemology
518-458-6228
1-800-458-1158

NY R-9 EPA

½ mi
Mine #1 → conveyor belt to mill
Mine #2 hauled 1½ mi unpaved - gravel
(ore overburden)
mine in rain
only for trucks

Mine #2 → mine #1




MILL

coarse mat'l stockpiled @ #2

RT
Vandub.

# Fugitive Emissions

① Road Emissions from Mine → storage yd

area = L * W = 2500 ft
width road = 24 ft
length road =

Assume: unpaved roads
1 truck carries 10 tons raw ore
1 truck has 6 wheels

$$E = 5.9k\left(\frac{s}{12}\right)\left(\frac{S}{30}\right)\left(\frac{W}{3}\right)^{.7}\left(\frac{w}{4}\right)^{.5}\left(\frac{365-p}{365}\right) \quad \frac{lb}{VMT}$$

s = 5.8
S = 30 mi/hr
W = 10 tons
p = 150 days
k = 1.0

$$E = 5.9(1)\left(\frac{5.8}{12}\right)\left(\frac{30}{30}\right)\left(\frac{10}{3}\right)^{.7}\left(\frac{6}{4}\right)^{.5}\left(\frac{365-150}{365}\right)$$

$$E = 4.779 \text{ lb/VMT}$$

$$\frac{40 \text{ tons}}{hr} \left| \frac{24 hr}{day} \right| \frac{1 \text{ vehicle}}{10 \text{ tons}} = 96 \text{ vehicle/day}$$

$$E = \frac{4.779 \text{ lb}}{\cancel{VMT}} \left| \frac{96 \cancel{Veh}}{\cancel{day}} \right| \frac{1 \cancel{day}}{24 hr} \left| .95 \cancel{mi} \right. = 18.1589 \frac{lb}{hr}$$

$E = 72153.791$ kg/yr

$E_{asb} = 721.538$ kg/yr

② Emis's unloading truck to pile

×10 ton/hr

Height$_{truck\ AVG}$ = 6ft = 1.83 m

Area$_{truck}$ = 8.36 m$^2$

$$E = k\,(.0032)\,\frac{\left(\frac{u}{5}\right)^{1.3}}{\left(\frac{m}{2}\right)^{1.4}} \quad \text{lb/ton}$$

$k_{30\mu m} = .74$ assume 30 μm for TSP

$u$ (mean wind speed) = 3.9 mi/hr

$m$ = % moist of ore = .2–6% = 3.1% Avg

$$E = .74\,(.0032)\,\frac{\left(\frac{3.9}{5}\right)^{1.3}}{\left(\frac{3.1}{2}\right)^{1.4}}$$

$E = 9.282 \times 10^{-4}$ lb/ton $\left(\frac{40\text{ ton}}{\text{hr}}\right) = 3.713 \times 10^{-2}\ \frac{\text{lb}}{\text{hr}}$

$E = 147.527$ kg/yr

$= 1.475$ kg/yr asb

③ Emissions from loading ore w/ front end loader

$H_{AV}$ = 6 ft = 1.83 m

$\text{area}_{\text{scoop}}$ = 1.23 $m^2$

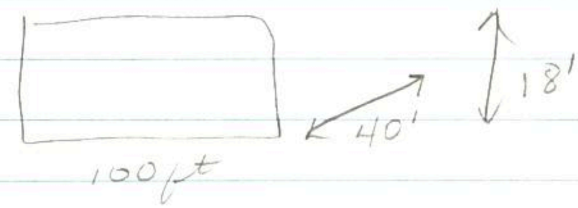
E = same as #2 = 147.527 kg/yr = 1.475 kg/yr asb

④ Wind emis's from contin Active Piles

$H_{AV}$ = 18' = 5.486 m

Area = 1800 $ft^2$ = 167.225 $m^2$

= .0413 acres




$$E = 1.7\left(\frac{s}{1.5}\right)\left(\frac{365-p}{235}\right)\frac{f}{15} \quad \frac{lb}{day \cdot acre}$$

s = 5.8%

p = 150

f = .16

$$E = 1.7\left(\frac{5.8}{1.5}\right)\left(\frac{365-150}{235}\right)\frac{.16}{15}$$

$$E = \frac{.0641\ lb}{\cancel{day} \cdot \cancel{acre}} \left| \frac{.0413\ \cancel{acre}}{} \right| \frac{365\ \cancel{day}}{yr}$$

E = .997 lb/yr = .439 kg/yr

= .00439 kg/yr asb

(5) Emiss from open conveyor belts at raw ore crusher

250' x 24" ⇒ area = 500 ft$^2$ = 46.452 m$^2$

40 tons/hr

$$E = k(.0032)\frac{\left(\frac{u}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \quad \frac{lb}{ton}$$

$k_{<30\mu m}$ = .74
$u$ = 3.9 mi/hr
$M$ = 3.1%

$E = 9.282 \times 10^{-4}$ lb/ton (40 ton/hr)
= 147.527 kg/yr

(6) Emiss from open conv belts at HD6 #1 + #2 screen overs ⇒ waste pile

area = 46.452 m$^2$
41,500 tons waste/yr

$E = 9.282 \times 10^{-4}$ lb/~~ton~~ (41,500 ~~ton~~/yr)
= 38.520 lb/yr
E = 17.473 kg/yr
E = .175 kg/yr asb

⑦ Wind Emiss from Waste Pile

area = 3 acres = $1.21 \times 10^4 m^2$
height = 30 ft = 9.14 m
diam = 39.62 m

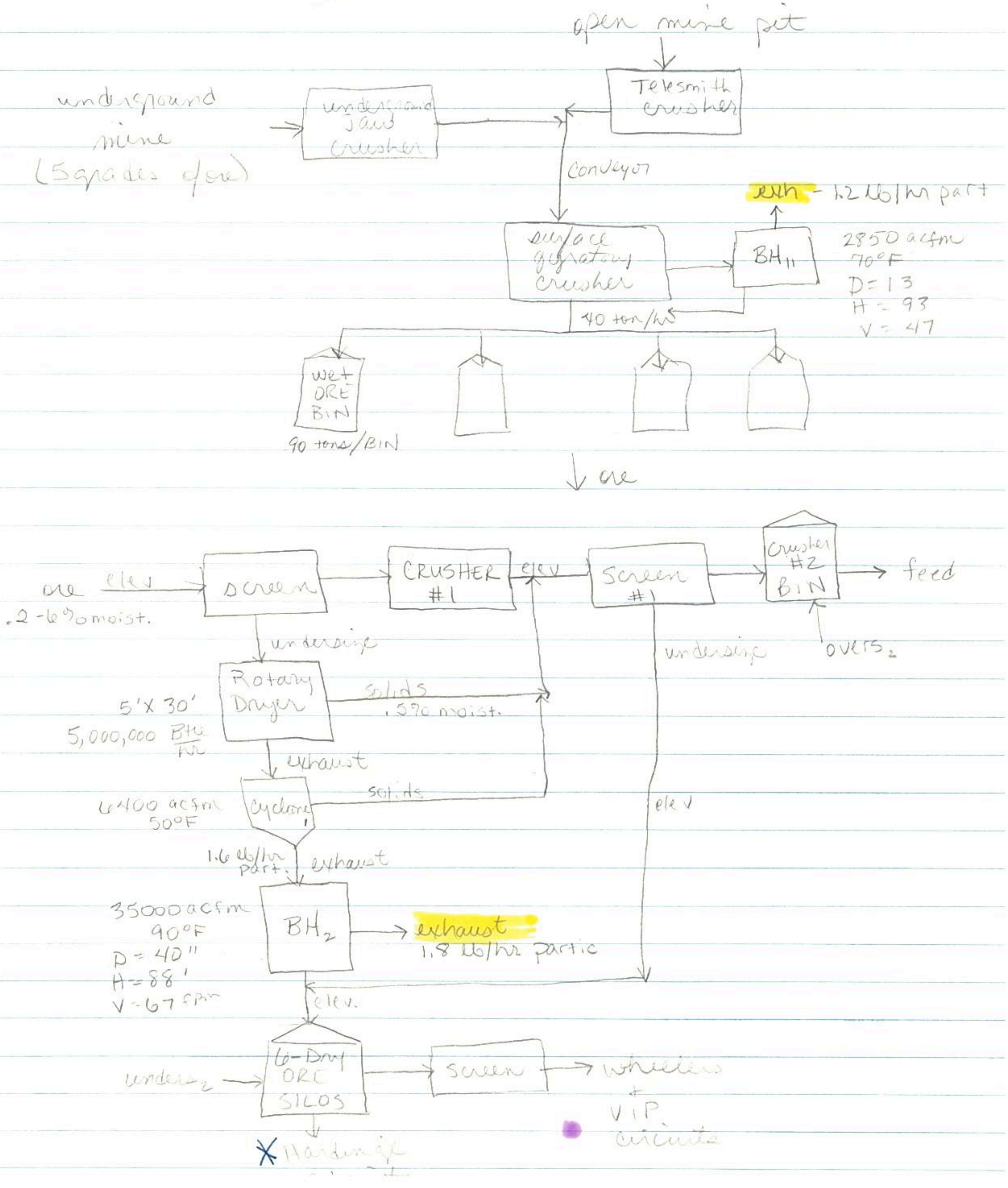
$$E = 1.7 \left(\frac{5.8}{1.5}\right)\left(\frac{365-150}{235}\right)\left(\frac{.16}{15}\right)$$

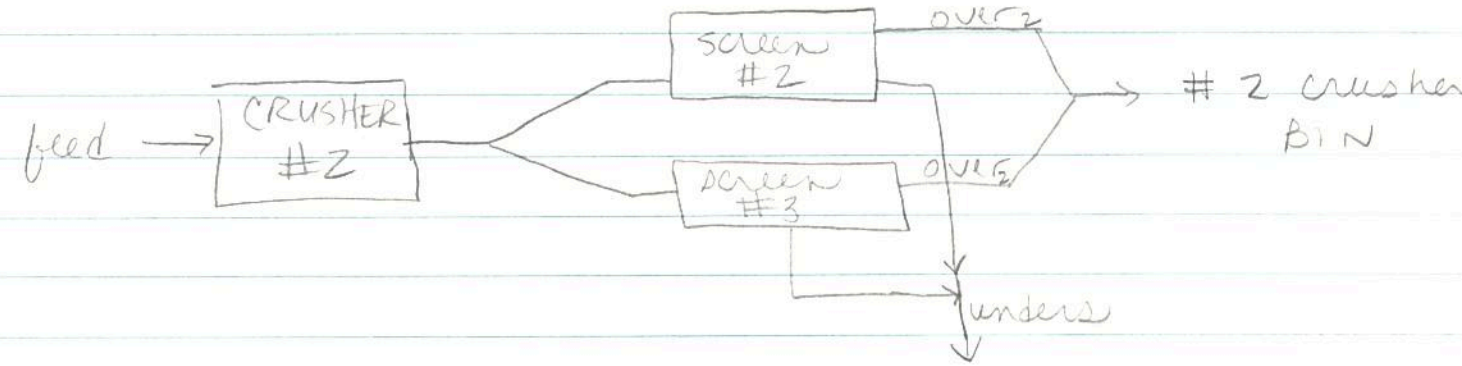
$$E = \frac{.0641 \text{ lb}}{\cancel{\text{day}} \cdot \cancel{\text{acre}}} \left| \frac{3 \cancel{\text{acre}}}{} \right| \frac{365 \cancel{\text{day}}}{\text{yr}}$$

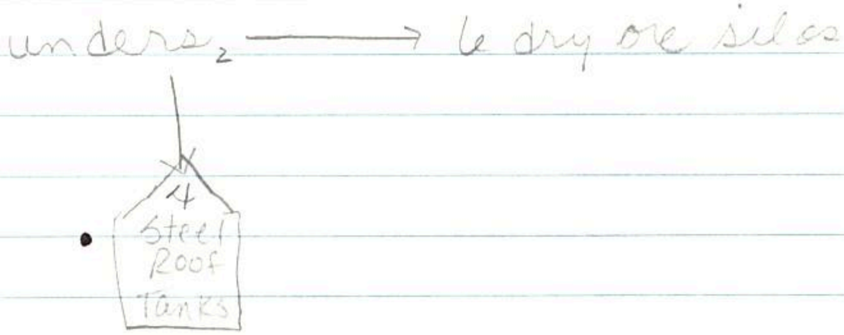
E = 70.242 lb/yr
E = 31.861 kg/yr
E = .319 kg/yr asb

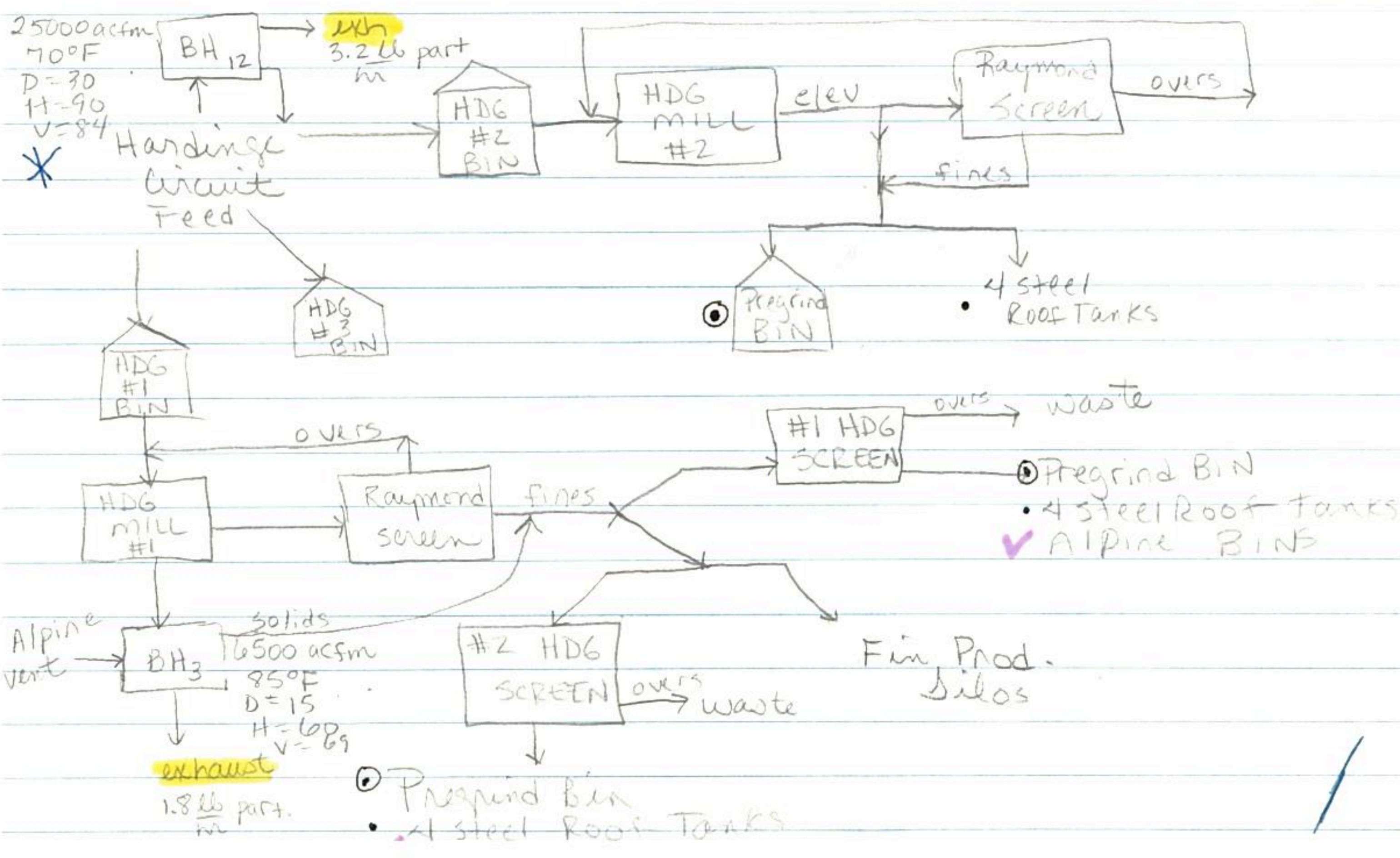
RT Vanderbilt

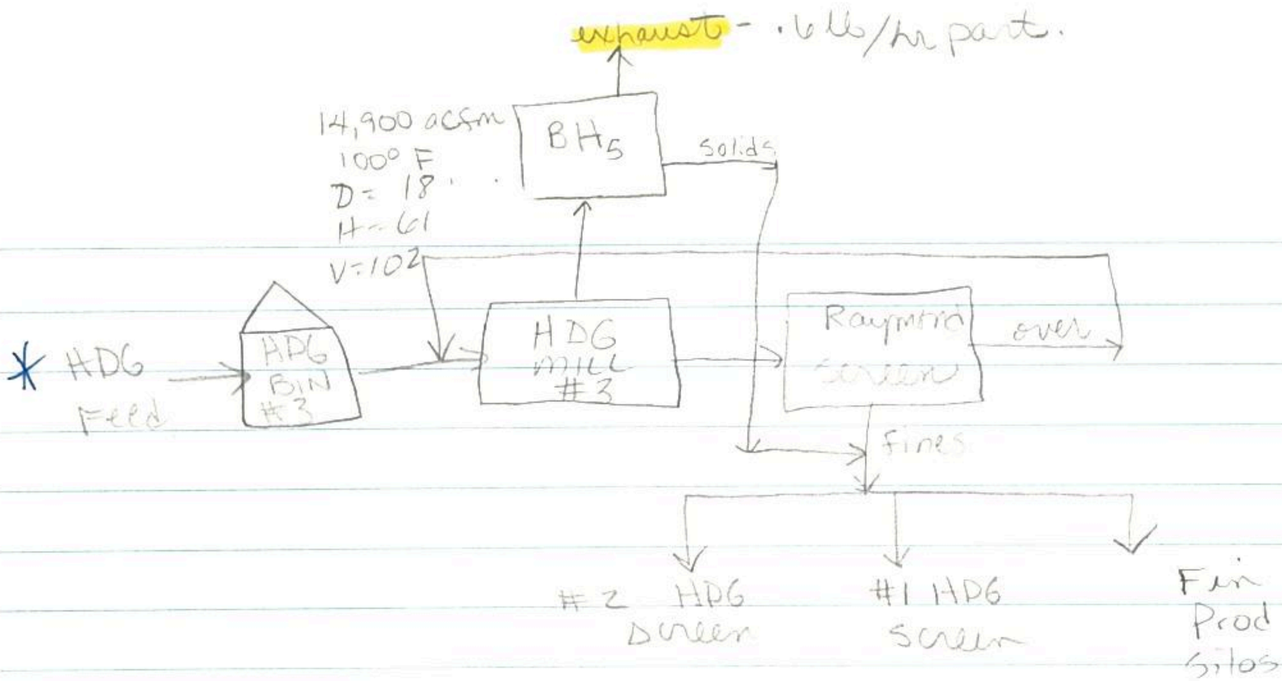
5000 tons

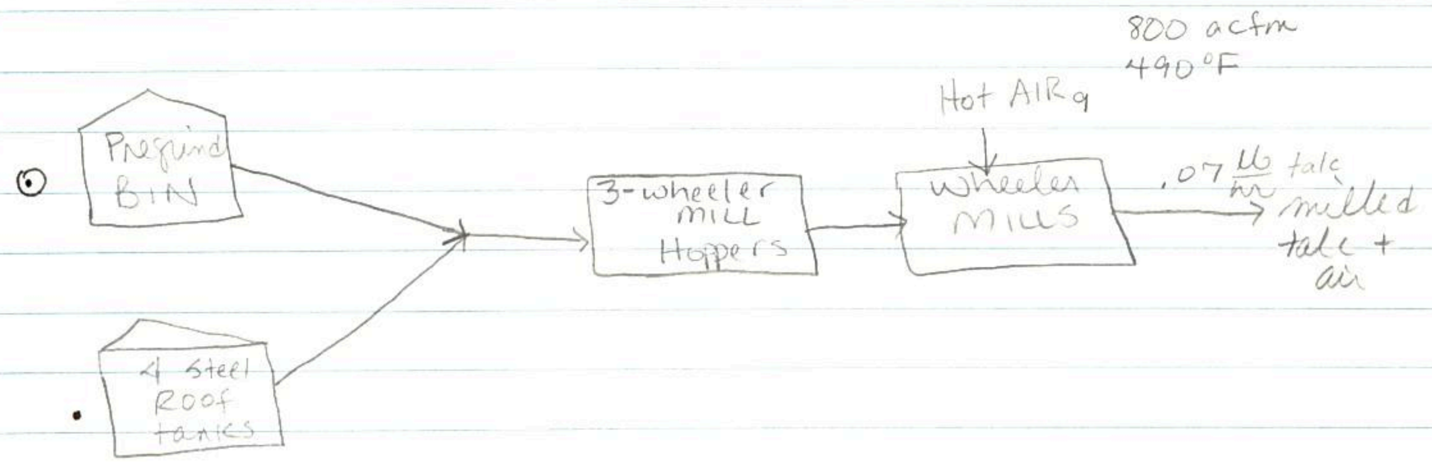


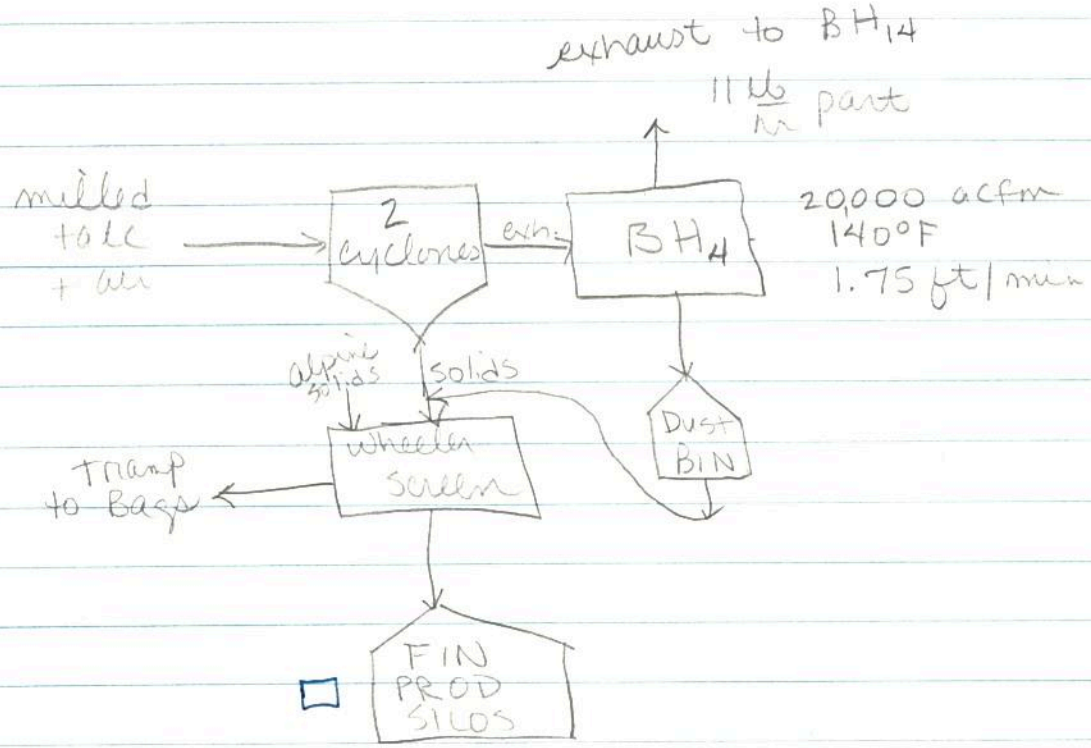

feed
CRUSHER #2
SCREEN #2
SCREEN #3
overs2
overs2
# 2 crusher BIN
unders

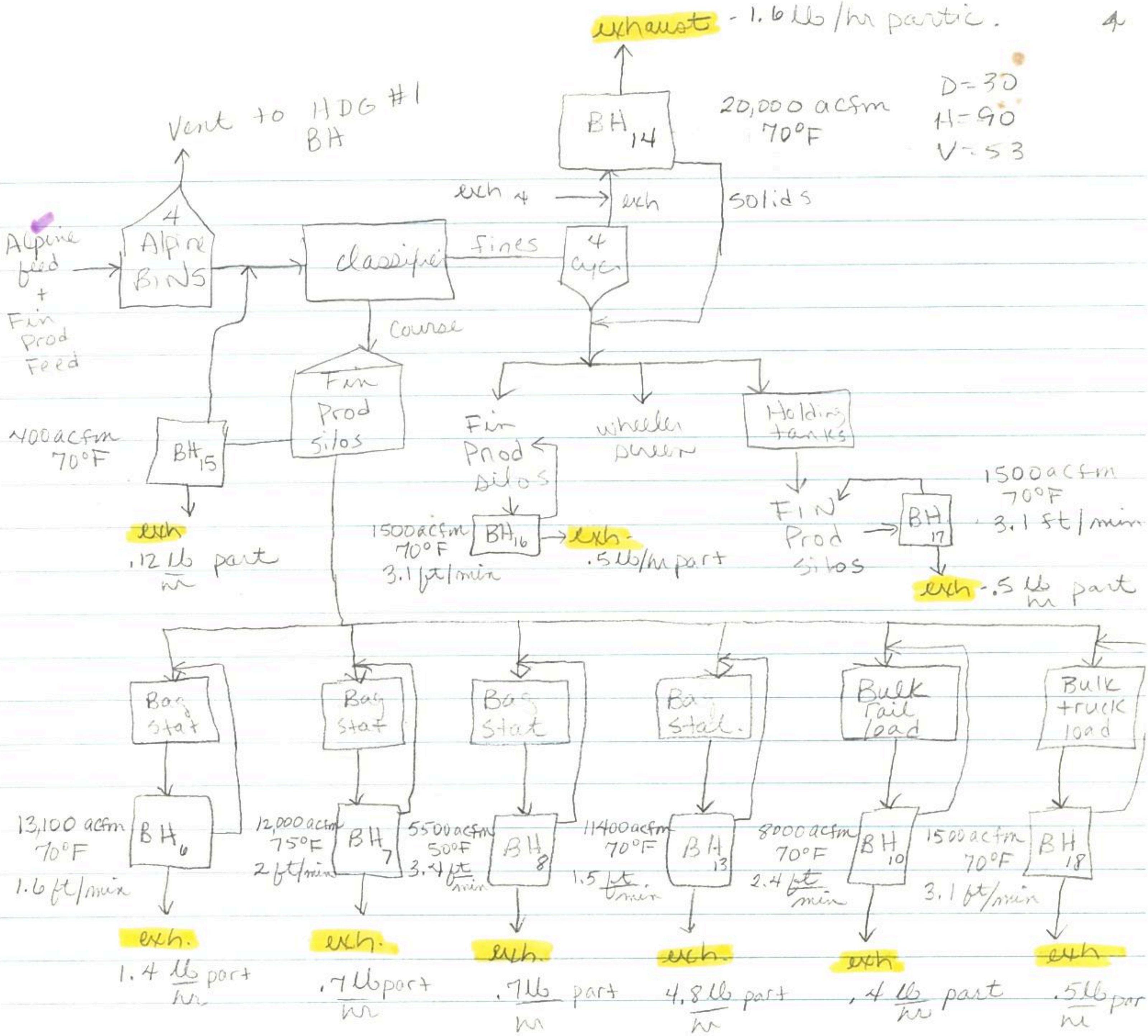

unders2
6 dry ore silos
4 Steel Roof Tanks


25000 acfm
70°F
D = 30
H = 90
V = 84
BH12
exh
3.2 lb/m part
Hardinge Circuit Feed
HDG #2 BIN
HDG MILL #2
elev
Raymond Screen
overs
fines
Pregrind BIN
4 steel Roof Tanks
HDG #3 BIN
HDG #1 BIN
overs
HDG MILL #1
Raymond screen
fines
#1 HDG SCREEN
overs
waste
Pregrind BIN
4 steel Roof Tanks
Alpine BIN
Alpine vent
BH3
solids
6500 acfm
85°F
D = 15
H = 60
V = 69
exhaust
1.8 lb/m part.
#2 HDG SCREEN
overs
waste
Fin. Prod. Silos
Pregrind Bin
4 steel Roof Tanks


exhaust - .6 lb/hr part.
14,900 acfm
100° F
D = 18'
H = 61
V = 102
BH5
solids
HDG Feed
HDG BIN #3
HDG MILL #3
Raymond screen
over
fines
#2 HDG screen
#1 HDG screen
Fin Prod Silos


800 acfm
490°F
Hot AIR9
Pregrind BIN
4 Steel Roof tanks
3-wheeler MILL Hoppers
Wheeler MILLS
.07 lb/hr talc
milled talc + air


exhaust to BH14
11 lb/hr part
milled talc + air
2 cyclones
exh.
BH4
20,000 acfm
140°F
1.75 ft/min
alpine solids
solids
Dust BIN
Wheeler screen
Tramp to Bags
FIN PROD SILOS


exhaust - 1.6 lb/hr partic.
D=30
H=90
V=53
BH 14
20,000 acfm
70°F
Vent to HDG #1 BH
exh 4
exh
solids
4 Alpine BINS
Alpine feed + Fin Prod Feed
classifier
fines
4 cyc.
course
Fin Prod silos
400 acfm 70°F
BH 15
exh
.12 lb/hr part
Fin Prod silos
wheeler screen
Holding tanks
1500 acfm 70°F 3.1 ft/min
BH 16
exh - .5 lb/hr part
FIN Prod silos
BH 17
1500 acfm 70°F 3.1 ft/min
exh - .5 lb/hr part
Bag stat
Bag stat
Bag stat
Bag stat.
Bulk rail load
Bulk truck load
13,100 acfm 70°F 1.6 ft/min
BH 6
12,000 acfm 75°F 2 ft/min
BH 7
5500 acfm 50°F 3.4 ft/min
BH 8
11400 acfm 70°F 1.5 ft/min
BH 13
8000 acfm 70°F 2.4 ft/min
BH 10
1500 acfm 70°F 3.1 ft/min
BH 18
exh.
1.4 lb/hr part
exh.
.7 lb/hr part
exh.
.7 lb/hr part
exh.
4.8 lb/hr part
exh
.4 lb/hr part
exh
.5 lb/hr par

(11) BH @ 311DG mill
D = 30
H = 90
V = 84
Q = 25,000
T = 70

(12) Bass + Pelletiz
D = 22
H = 100
V = 54
Q = 11,400
T = 70

(13) alpine Class
D = 30
H = 90
V = 53
Q = 20,000
T = 70

(14) Storage silo # 11
D = 8
H = 85
V = 19
Q = 400
T = 70

(15) Stor silo 15
D = 9
H = 95
V = 66
Q = 1500
T = 70

(16) venting of prod-silo 16
D = 6 x 9
H = 95
V = 57
Q = 1300
T = 70

(17) venting of FP of silo 6
D = 6 x 9
H = 65
V = 66
Q = 1500
T = 70

(18) venting bulk truck ta
D = 3 x 6
H = 55
V = 66
Q = 1500
T = 70

(19) wheeler feed tank
D = 6 x 9
H = 60
V = 57
Q = 1500
T = 70

(20) venting of FP silo 8
D = 6 x 9
H = 60
V = 66
Q = 1500
T = 70

(21) Bulk load trucks

D = 6X9

H = 30

V = 66

Q = 1600

T = 70

Raw Mat'l : Granular tremolite / talc

-polarized light :
- total fiber content including non-asb fibers

<1% - 4%

* aspect ratio > 3:1 + > 5µm in length + > 3µm in width, but not mineralogically fibrous or asbestosform ⇒ tremolite cleavage fragments

Prod :
- polarized light
- total fiber content including non-asb. fibers

15% - 40% , Avg 25%

* 457-2072 Labor Dept. Chris

Environmental Reporter - Ray Bell 518-457-5385

Mr. Maras Tirums 518-457-6379 Regs
NY Dept of Envir Cons.
50 Wolf Rd
Albany, NY 12233-0001

gen # 518-457-3446

- - - - - - - - - -

Regional office Region 6 office
Region AP Env.
David Prosser
315-785-2513

5-18
5/16/88

R.T. Vanderbilt Company, Inc.
INDUSTRIAL MINERALS AND CHEMICALS

30 WINFIELD STREET, NORWALK, CONNECTICUT 06855 • (203) 853-1400
CABLE: "BILTVAN", NORWALK, CONNECTICUT • TWX 710-468-2940

May 12, 1988

Mr. Jack R. Farmer
Director, ESED (MD-13)
U. S. ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, NC 27711

Dear Mr. Farmer:

Please find enclosed R. T. Vanderbilt Company, Inc.'s response to your request for information concerning our talc mine in upstate New York.

Please note that this company considers all the enclosed information as confidential and proprietary information.

Very truly yours,

R. T. VANDERBILT COMPANY, INC.

Paul Vanderbilt

Paul Vanderbilt, Director
Environmental Affairs

PV/sk
enclosure

Status:

① Model: RT Vanderbilt
* NY Envir Cons pending Stack Parameters info 5-9-89
~~①~~ raw mat'l thruput + prod rate + description
② dist from mine to storage pile
③ type of road - paved?
④ size (tons) / truck
⑤ type of dust suppresants, ie covered truck, $H_2O$ spraying
⑥ # of piles (storage, product, waste) + dimensions (height, width, length, area) distance to plant + activity
⑦ "outside" conveying systems to + from piles, dimensions + description - covered, vented...
~~⑧~~ destination + treatment of waste mat'l

Polarized Light Microscopy

Ask R. T. Vanderbilt
which optical parameters they measured & what
values were given for each

According to Table 1-1 of the Interim Method for
the Determination of Asbestos in Bulk Insulation
Samples (EPA-600/M4-82-020, Dec 1982)
There are 6 optical properties

F.Y.I. The property we are most interested in
is the angle of extinction - good for tremolite
RT's - Slim Thompson (Mineralogists)

Mike Beard
Ann Wiley - ASDM D-2205 committee
PLM methodology

5320

TALC

Mr. Allan M. Harvey
Director of Environmental Affairs
Gouverneur Talc Company, Inc.
30 Winfield Street
Norwalk, CT 06855

(203) 853-1400    Contact: Paul Vanderbilt
Dir of Env Affairs
VP

No response as of 12/17/87

Andy Smith Was ref'd to Vanderbilt on 10/13/87

3/3/88 - 2nd 114 sent

5/2/88 - I called Vanderbilt - he will locate questionnaire + respond by 5/15 - I told him that if he can't find either 114, that I will send him a copy, but it must be returned by 5/15

5/16/88 Received package, placed in CBI files.

5/9/89 Talked w/ Paul Vanderbilt, requesting info on prod'n thruput - will send letter

1 facility,

25% w/ 3:1 aspect

ISB-1-4 6-2 6/3/88

# R. T. Vanderbilt Company, Inc.

INDUSTRIAL MINERALS AND CHEMICALS

30 WINFIELD STREET, NORWALK, CONNECTICUT 06855 • (203) 853-1400
CABLE: "BILTVAN", NORWALK, CONNECTICUT • TWX 710-468-2940

June 1, 1988

Mr. Jack R. Farmer
Director, ESED (MD-13)
U. S. ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, NC 27711

Dear Mr. Farmer:

I would like to add two points to this company's response to your request for information concerning our talc mine in upstate New York, which was mailed to you on May 12, 1988.

1. Included with the response was a "Hardinge Circuit Flow Sheet", dated 2-18-74. This flow sheet shows three Hardinge mills, whereas there are now six in operation, essentially duplicating the process displayed. There is also one more dry ore silo in operation, for a total of seven.

2. In our answer to question E (2)(c), reference is made to transitional particles (talc-anthophyllite, predominantly talc). A recent particle count taken of work area air samples at our New York mine and mill showed that the best estimate we can give for these particles is 0.0012% of the total dust taken in the sample.

Again, please note that this company considers this information, and that in the previous response, confidential. Please contact me if I can be of assistance.

Very truly yours,

R. T. VANDERBILT COMPANY, INC.

Paul Vanderbilt

Paul Vanderbilt, Director
Environmental Affairs

PV/sk

Al V. - this ones yours. Ken

Governeur Talc

~~Dinkar~~ ~~Crowder~~ 5/16/88

# R.T. Vanderbilt Company, Inc.

INDUSTRIAL MINERALS AND CHEMICALS

30 WINFIELD STREET, NORWALK, CONNECTICUT 06855 • (203) 853-1400
CABLE: "BILTVAN", NORWALK, CONNECTICUT • TWX 710-468-2940

Bruce check it out please Al

May 12, 1988

Mr. Jack R. Farmer
Director, ESED (MD-13)
U. S. ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, NC 27711

Dear Mr. Farmer:

Please find enclosed R. T. Vanderbilt Company, Inc.'s response to your request for information concerning our talc mine in upstate New York.

Please note that this company considers all the enclosed information as confidential and proprietary information.

Very truly yours,

R. T. VANDERBILT COMPANY, INC.

Placed in CBI Files

Paul Vanderbilt

Paul Vanderbilt, Director
Environmental Affairs

PV/sk
enclosure

Gouverneur Talc Co

PROJECT 87/05

Crowder

Servant

6-2 6/2100

**R.T. Vanderbilt Company, Inc.**
INDUSTRIAL MINERALS AND CHEMICALS

30 WINFIELD STREET, NORWALK, CONNECTICUT 06855 • (203) 853-1400
CABLE: "BILTVAN", NORWALK, CONNECTICUT • TWX 710-468-2940

June 1, 1988

Mr. Jack R. Farmer
Director, ESED (MD-13)
U. S. ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, NC 27711

Dear Mr. Farmer:

I would like to add two points to this company's response to your request for information concerning our talc mine in upstate New York, which was mailed to you on May 12, 1988.

Original in file.

Confidential.
MJC

Front - End Loaders

$$A_1 = \frac{4\,yd^3}{4.5'} = \frac{108\,ft^3}{4.5'} = 24\,ft^2$$

$$A_2 = \frac{3.5\,yd^3}{4.382'} = \frac{94.5\,ft^3}{4.382\,ft} = 21.565\,ft^2$$

$$A_3 = \frac{1\,yd^3}{10.577\,ft} = \frac{27\,ft^3}{10.577\,ft} = 2.553\,ft^2$$

$$A_{AV} = \frac{2A_1 + A_2 + A_3}{4} = 18.029\,ft^2 = 1.675\,m^2$$

R.T. Vanderbilt

- talc mine - Upstate, NY
  6 Hardinge mills + 1 dry ore silo

.0012% anthrophyllite E-2C

lat 44 15 30 — 24 hr/day - 6 day/wk - 52 wk/yr
long 75 23 30 — Gouverneur, NY

Raw Mat'l - tremolite talc schist w/ antigorite

Waste — 1500 tons ground product spillage
40,000 tons waste rock overburden

- source of underground mine - one underground mine + 2 open mine pits on comp. prop.

Raw Mat'l - total fiber content of collected mat'l incl. non-asb. fibers (% of particle count of air sample)
<1% - 4%, 3% Avg (~3%) by polarized light
+ predom. tremolite cleavage fragments - doesn't fit asb. def.

- belt conveyors for coarsest crushing product - largest 250' x 24" smallest 12' x 24" uncovered
- screw conveyors - covered ⇒ BH
- bucket elevators - enclosed ⇒ BH

① BH @ crusher

E = 1.2 lb/hr T = 70

D = 13" = .33 m

H = 93' = 28.346 m

V = 47 ft/min = .239 m/s

② BH @ dryer

E = 1.8 lb/hr T = 90

D = 40" = 1.016 m

H = 88' = 26.822 m

V = 67 FPm = .340 m/s

③ BH @ HDG air

E = 3.2

D = 30 = .762 m

H = 90 = 27.432

V = 84 = .427

T = 70

④ BH @ HDG #1

E = 1.8

D = 15 = .381 m

H = 60 = 18.288 m

V = 69 = .351 m/s

T = 85

⑤ BH @ HDG #3

E = .6

D = 18 = .457 m

H = 61 = 18.593 m

V = 102 = .518 m/s

T = 100

⑥ BH @ Class.

E = 1.6

D = 30 = .762 m

H = 90 = 27.432 m

V = 53 = .269 m/s

T = 70

⑦ BH @ FP #1

E = .12

D = 8 = .203 m

H = 85 = 25.908 m

V = 19 = .0965 m/s

T = 70

⑧ BH @ FP #2

E = .5

D = 9 = .229 m

H = 95 = 28.956

V = 66 = .335 m/s

T = 70

⑨ BH @ FP #3

E = .5

D = 6x9 = .229 m

H = 65 = 19.812 m

V = 66 = .335 m/s

T = 70 =

⑩ BH @ Bag #1

E = 1.4

D = 25 = .635 m

H = 25 = 7.62 m

V = 64 = .325 m/s

T = 70

(11) BH @ Bag #2

E = .7

D = 22 = .559 m

H = 27 = 8.230 m

V = 60 = .305 m/s

T = 75

(12) BH @ Bag #3

E = .7

D = 15 = .381 m

H = 64 = 19.507 m

V = 59 = .300 m/s

T = 50

(13) BH @ Bag #4

E = 4.8

D = 22 = .559 m

H = 100 = 30.480 m

V = 54 = .274 m/s

T = 70

(14) Bulk rail

E = .4

D = 17 = .432 m

H = 39 = 11.887 m

V = 71 = .361 m/s

T = 70

(15) @ Bulk truck

E = .5

D = 3 x 6 = .152 m

H = 55 = 16.764 m

V = 66 = .335 m/s

T = 70

Emissions ? 190

① BH - crusher

1.2 lb/hr | 24 hr/day | 6 day/wk | 52 wk/yr | .453593 kg/1 lb = kg/yr

47.682 kg/yr asb

② BH @ Dryer (1.8) = 7152.254 kg/yr = 71.523 kg/yr asb

③ BH @ Hardinge Circuit (3.2) = 12,715.119 = 127.151 asb

④ BH @ HDG #1 (1.8) = 7152.254 = 71.523 asb

⑤ BH @ HDG #3 (.6) = 2384.085 = 23.841 asb

⑥ BH @ Classifier (1.6) = 6357.559 = 63.576 asb

⑦ BH @ Fin #1 (.12) = 476.817 = 4.768 asb

⑧ BH @ Fin #2 (.5) = 1986.737 = 19.867 asb

⑨ BH @ FIN #3 (.5) = 1986.737 = 19.867 asb

⑩ BH @ Bag #1 (1.4) = 5562.865 = 55.629

⑪ " #2 (.7) = 2781.432 = 27.814

⑫ " #3 (.7) = 2781.432 = 27.814

⑬ " #4 (4.8) = 19,072.678 = 190.727

⑭ BH @ Bulk rail load (.4) = 1589.390 = 15.894

⑮ BH @ Bulk truck load (.5) = 1986.737 = 19.867

① BH @ wheeler mill grinding
D = 15"
H = 66'
Vel = 66 ft/min
Flowrate = 4900 ft³/min
T = 70°F

② BH @ Alpine classif
D = 15
H = 20
V = 59
Q = 4200
T = 70

③ BH @ Packing
D = 24 x 16
H = 25
V = 82
Q = 13190
T = 70

④ BH @ main mill
D = 23
H = 70
V = 98
Q = 20,000
T = 70

⑤ BH @ crushing screening Dry + conv of coarse talc
D = 11
H = 45
V = 103
Q = 5200
T = 70

⑥ BH of fine grind + class circuits of woll-astonite rock prod
D = 10 x 12
H = 18
V = 78
Q = 3900
T = 70

⑦ Vent for dry crusher ore BIN #3
D = 6 x 9
H = 5
V = 57
Q = 1500
T = 70

⑧ Vent for dry crushed ore #1
D = 6 x 9
H = 5
V = 57
Q = 1500
T = 70

⑨ BH for crusher + dry ore section assoc proc woll. rock
D = 24 x 21
H = 57
V = 35
Q = 12,000
T = 70

BH
① Prim gyp. crusher & feed & disch. conv @ cyclone

D = 17
H = 41
V = 67
Q = 6400
T = 50

② BH - main - coarse ore crush, screen, conv. & grind feed

D = 40
H = 88
V = 67
Q = 35,000
T = 90

③ BH of prod stor & conv.

D = 15
H = 60
V = 69
Q = 6500
T = 85

④ BH fine grind & class - powders

D = 26
H = 67
V = 74
Q = 20,000
T = 140

⑤ BH on HD6 mill

D = 18
H = 61
V = 102
Q = 14,900
T = 100

⑥ BH @ 4 spout Bagger

D = 25
H = 25
V = 64
Q = 13,100
T = 70

⑦ BH @ Bagger

D = 22
H = 27
V = 60
Q = 12,000
T = 75

⑧ 3-tube Bagger

D = 15
H = 64
V = 59
Q = 5500
T = 50

⑨ BH @ Bulk railroad load

D = 17
H = 39
V = 71
Q = 8000

⑩ BH - storage silos 12, 13, 14

D = 13
H = 93
V = 47
Q = 2850

mine #1 8 hr/day, 5 day/wk, 52 wk/yr
mine #2 16 hr/day, 5 day/wk, 52 wk/yr

Raw Mat'l 204,258 tons

① Fugitive emissions : 3 open conveyors
② Fug : 10 storage piles

questions

1. $H_2O$ing : "2 days after end of last rainstorm ;
   2000 gall in 1 1/2 min
2. ? more at same time

- according to Development of Emission Factors for Fugitive Dust Sources (EPA) June 1974, for avg vehicle speed < 30 mph the Duwamish Valley study + Sehmel's measurements indicate that emissions ↑ in proportion to the square of vehicle speed

- NCC - could use a corrected emission factor like above & relate to study
- take actual measurements - silt content, % moist of ore & road - size, height

- from BID Draft March 5, 1987 - could calculate BH failures, freq & duration

- particulate emiss are reduced by ① ↓ing vehicular variables thru use of traffic ctrls ② ↓ing silt variables by applying dust suppressants by adding gravel or by paving
- dust emiss are proportional to vehicle speed

**New York State Department of Environmental Conservation**
317 Washington Street
Watertown, New York 13601
315-785-2513

**Thomas C. Jorling**
**Commissioner**

May 15, 1989

Mrs. Beth Oliver
Mail Drop 13
USEPA-OAQPS-ISB
Research Triangle Park, NC 27711

RE: GOUVERNEUR TALC - ST. LAWRENCE COUNTY

Dear Mr. Oliver:

Attached please find computer printouts of the data currently in our emissions inventory concerning the Gouverneur Talc Company's three locations in Region 6. You will find tack parameters such as exit velocity, flow rate, temperature, stack height, etc.

Should you have any questions or comments concerning the interpretations of this data, please feel free to contact me.

Sincerely,

David W. Prosser, P.E.
Regional Air Engineer
Region 6

DWP:kw
Attachments

733-7166

Regional Adm.

518 -

James Stanley

NY OSHA - 472 -6085 / 212-337-2325

NY MSHA

OSHA Washington Mike Lee or Tom Tybarski

FTS-523-6441

518

~~NY Steve Olender 457-1538~~

Mark Sonsceland

~~Div. safety & Health~~

7485-7141

~~Barry Russ Consultant~~ 457-5508

NY Environmental Conservation -

Air Resources Bureau of Toxic Air Samp

Arthur Fossa 518-457-7454

Randy Bell - 457-5385 back on Monday

chris Mouyos 457-1026 Labor dep

to call back

OSHA Bill Bynoe FTS-660-2339

will call back

Mike Laney (response to 1984 EPA request)

Preamble to proposed rule in 87 (Visible emissions)

Dennis Santella R-2 EPA analyzed samples of R.T. Vanderbilt

qu

Questions for RT Vanderbilt

1. ? % asb in ore + stacks - for stack emiss - is it particulate - any testing for asbestos
2. $H_2O$ing : ? times/day / yr - area?
3. ? length of road ; do only $H_2O$ that road - what type of road - ? types of vehicular travel
4. ? specific info on 2 mines - roads - travel - haul trucks
5. ? piles + areas
6. ? height of conveyor belt + depth of belt
7. ? % non-fibrous tremolite - ? CBI files correct

Region :

National

NY Sta

RTP -

NY St

625, 1985

John

1985

1

12, 1975

B

X-Ray :

```
FSPSPLANT_NAME  LATITUDLONGITUDCITY  STTSTAHEIGHTAREA    VDIAMETEVELOCITEMPEEMISSIONSASSUMDESCRIPTION            GIVEMISSIONS
AT* R.T. Vanderb441530  752330 *GouverNYP 1 28.35   10.00 * 0.330 0.239 294    40.758 1.00 CRUSHER BAGHOUSE AT MINE  1%  4075.805  1.20 3396.504 204258
AT* R.T. Vanderb441530  752330 *GouverNYP 2 26.82   10.00 * 1.016 0.340 305    61.137 1.00 BAGHOUSE AT DRYER         1%  6113.708  1.80 3396.504 204258
AT* R.T. Vanderb441530  752330 *GouverNYP 3 27.43   10.00 * 0.762 0.427 294   108.688 1.00 BH AT HARDINGE CIRCUIT    1% 10868.814  3.20 3396.504 204258
AT* R.T. Vanderb441530  752330 *GouverNYP 4 18.29   10.00 *                                                          1%  6113.708  1.80 3396.504 204258
AT* R.T. Vanderb                                                                                                     1%  2037.903  0.60 3396.504 204258
AT* R.T. Vanderb                                                                                                     1%  5434.407  1.60 3396.504 204258
AT* R.T. Vanderb                                                                                                     1%   407.581  0.12 3396.504 204258
AT* R.T. Vanderb                                                                                                     1%  1698.252  0.50 3396.504 204258
AT* R.T.                                                                                                             1%  1698.252  0.50 3396.504 204258
AT* R.T.                                                                                                             1%  4755.106  1.40 3396.504 204258
AT* R.T.                                                                                                             1%  2377.553  0.70 3396.504 204258
AT* R.T.                                                                                                             1%  2377.553  0.70 3396.504 204258
AT* R.T.                                                                                                             % 16303.221  4.80 3396.504 204258
AT* R.T.                                                                                                             %  1358.602  0.40 3396.504 204258
AT* R.T.                                                                                                             %  1698.252  0.50 3396.504 204258
AT* R.T.                                                                                                             % 56109.450                204258
AT* R.T.                                                                                                                 27.938                 204258
AT* R.T.                                                                                                                177.332                 204258
AT* R.T                                                                                                                 156.466                 204258
AT* R.T                                                                                                                  23.615                 204258
AT* R.T                                                                                                                   5.051                 204258
AT* R.T                                                                                                                   8.419                 204258
AT* Cy                                                                                                                  408.063                  20450
AT* Cy                                                                                                                  612.095                  20450
AT* Cy                                                                                                                  495.024                   9303
AT* Cy                                                                                                                  278.451                   9303
AT* Cy                                                                                                                   92.817                   9303
AT* C                                                                                                                   247.512                   9303
AT* C                                                                                                                    18.563                   9303
AT* C                                                                                                                    77.347                   9303
AT* C                                                                                                                    77.347                   9303
AT* C                                                                                                                   216.573                   9303
AT* C                                                                                                                   108.286                   9303
AT*                                                                                                                     108.286                   9303
AT*                                                                                                                     742.536                   9303
AT*                                                                                                                      61.878                   9303
AT*                                                                                                                      77.347                   9303
AT*                                                                                                                     617.593                  20450
AT*                                                                                                                       2.797                  20450
AT*                                                                                                                      19.757                  20450
AT*                                                                                                                      15.665                  20450
AT*                                                                                                                       2.354                  20450
AT*                                                                                                                       0.506                  20450
AT                                                                                                                        0.843                  20450
AT                                                                                                                        7.817                 208368
AT                                                                                                                        6.726                 208368
AT                                                                                                                        5.452                  12130
AT                                                                                                                        5.067                  12130
AT                                                                                                                         .022                  12130
AT                                                                                                                         .726                  12130
A                                                                                                                          .204                  12130
A                                                                                               SILO #2              0%  100.852                  12130
A                                                                                               SILO #3              0%  100.852                  12130
                                                                                                ION #1               0%  282.385                  12130
```

EE 7

Lat - 441530
Long - 752330

21
8

albany : 25.7 mi/m > 12   10 yr
AV = 8.6

Binghamton : 30.3
AV = 10.0

tele
tic

Buffalo : 44   WE-12
AV = 12.4

NY : 48
AV = 12.9

Rochester : 36.6   WD-18
AV = 11.2

Be

Syracuse 29.5
AV - 9.7

A

Fi

Ca:

China

Ca

F

feeding set
22.50 2pc.   spoon 11.75 Susan
fork

+AT* Cyprus Beave451300 1121800 *Alder MTP11 8.23 10.00 * 0.559 0.305 297 1.412 1.00 BH AT BAG STATION #2 0% 141.193 12130

FSPSPLANT_NAME LATITUDLONGITUDUCITY STTSTAHEIGHTAREA VDIAMETEVELOCITEMPEEMISSIONSASSUMDESCRIPTION GIVEMISSIONS

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTP12 | 19.51 | 10.00 | * | 0.381 | 0.300 | 283 | 1.412 | 1.00 | BH AT BAG STATION #3 | 0% | 141.193 | | 12130 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTP13 | 30.48 | 10.00 | * | 0.559 | 0.274 | 294 | 9.682 | 1.00 | BH AT BAG STATION #4 | 0% | 968.178 | | 12130 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTP14 | 11.89 | 10.00 | * | 0.432 | 0.361 | 294 | 0.807 | 1.00 | BH AT BULK RAIL LOAD | 0% | 80.681 | | 12130 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTP15 | 16.76 | 10.00 | * | 0.152 | 0.335 | 294 | 1.009 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 100.852 | | 12130 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 0.00 | 17657.98 | * | 0.000 | 0.100 | 293 | 572.385 | 1.00 | ROAD EM. MINE TO PILE | 0% | 57238.463 | | 208368 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 1.81 | 14.08 | * | 0.000 | 0.100 | 293 | 0.285 | 1.00 | EM. UNLOADING TRUCK TO FIL | 0% | 28.500 | | 208368 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 3.85 | 1.68 | * | 0.000 | 0.100 | 293 | 2.013 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 201.303 | | 208368 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 4.57 | 1170.58 | * | 15.240 | 0.100 | 293 | 1.596 | 1.00 | WIND EM. FROM FEED PILE | 0% | 159.614 | | 208368 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 6.25 | 52.12 | * | 0.000 | 0.100 | 293 | 0.241 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 24.090 | | 208368 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 3.20 | 11.15 | * | 0.000 | 0.100 | 293 | 0.052 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 5.153 | | 208368 |
| AT* | Cyprus Beave451300 | 1121800 | *Alder MTF 0 | 7.77 | 18.58 | * | 0.000 | 0.100 | 293 | 0.086 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 8.588 | | 208368 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 1 | 28.35 | 10.00 | * | 0.330 | 0.239 | 294 | 134.415 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 13441.549 | | 673620 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 2 | 26.82 | 10.00 | * | 1.016 | 0.340 | 305 | 201.623 | 1.00 | BAGHOUSE AT DRYER | 0% | 20162.324 | | 673620 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 3 | 27.43 | 10.00 | * | 0.762 | 0.427 | 294 | 87.835 | 1.00 | BH AT HARDINGE CIRCUIT | 0% | 8783.467 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 4 | 18.29 | 10.00 | * | 0.381 | 0.351 | 303 | 49.407 | 1.00 | BH AT HDG MILL #1 | 0% | 4940.700 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 5 | 18.59 | 10.00 | * | 0.457 | 0.518 | 311 | 16.469 | 1.00 | BH AT HDG MILL #3 | 0% | 1646.900 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 6 | 27.43 | 10.00 | * | 0.762 | 0.269 | 294 | 43.917 | 1.00 | BH AT CLASSIFIER | 0% | 4391.733 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 7 | 25.91 | 10.00 | * | 0.203 | 0.097 | 294 | 3.294 | 1.00 | BH AT FIN PROD SILO #1 | 0% | 329.380 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 8 | 28.96 | 10.00 | * | 0.229 | 0.335 | 294 | 13.724 | 1.00 | BH AT FIN PROD SILO #2 | 0% | 1372.417 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP 9 | 19.81 | 10.00 | * | 0.229 | 0.335 | 294 | 13.724 | 1.00 | BH AT FIN PROD SILO #3 | 0% | 1372.417 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP10 | 7.62 | 10.00 | * | 0.635 | 0.325 | 294 | 38.428 | 1.00 | BH AT BAG STATION #1 | 0% | 3842.767 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP11 | 8.23 | 10.00 | * | 0.559 | 0.305 | 297 | 19.214 | 1.00 | BH AT BAG STATION #2 | 0% | 1921.383 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP12 | 19.51 | 10.00 | * | 0.381 | 0.300 | 283 | 19.214 | 1.00 | BH AT BAG STATION #3 | 0% | 1921.383 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP13 | 30.48 | 10.00 | * | 0.559 | 0.274 | 294 | 131.752 | 1.00 | BH AT BAG STATION #4 | 0% | 13175.200 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP14 | 11.89 | 10.00 | * | 0.432 | 0.361 | 294 | 10.979 | 1.00 | BH AT BULK RAIL LOAD | 0% | 1097.933 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTP15 | 16.76 | 10.00 | * | 0.152 | 0.335 | 294 | 13.724 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 1372.417 | | 165068 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 0.00 | 17657.98 | * | 0.000 | 0.100 | 293 | 1850.427 | 1.00 | ROAD EM. MINE TO PILE | 0% | ********** | 185042.68 | 673620 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 1.81 | 14.08 | * | 0.000 | 0.100 | 293 | 0.921 | 1.00 | EM. UNLOADING TRUCK TO FIL | 0% | 92.136 | | 673620 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 3.85 | 1.68 | * | 0.000 | 0.100 | 293 | 6.508 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 650.779 | | 673620 |
| AT* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 4.57 | 1170.58 | * | 15.240 | 0.100 | 293 | 5.160 | 1.00 | WIND EM. FROM FEED PILE | 0% | 516.007 | | 673620 |
| T* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 6.25 | 52.12 | * | 0.000 | 0.100 | 293 | 0.779 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 77.880 | | 673620 |
| T* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 3.20 | 11.15 | * | 0.000 | 0.100 | 293 | 0.167 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 16.658 | | 673620 |
| T* | Cyprus Yello450500 | 1114400 | *CameroMTF 0 | 7.77 | 18.58 | * | 0.000 | 0.100 | 293 | 0.278 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 27.765 | | 673620 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 1 | 28.35 | 10.00 | * | 0.330 | 0.239 | 294 | 6.705 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 670.461 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 2 | 26.82 | 10.00 | * | 1.016 | 0.340 | 305 | 10.057 | 1.00 | BAGHOUSE AT DRYER | 0% | 1005.692 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 3 | 27.43 | 10.00 | * | 0.762 | 0.427 | 294 | 17.879 | 1.00 | BH AT HARDINGE CIRCUIT | 0% | 1787.896 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 4 | 18.29 | 10.00 | * | 0.381 | 0.351 | 303 | 10.057 | 1.00 | BH AT HDG MILL #1 | 0% | 1005.692 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 5 | 18.59 | 10.00 | * | 0.457 | 0.518 | 311 | 3.352 | 1.00 | BH AT HDG MILL #3 | 0% | 335.231 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 6 | 27.43 | 10.00 | * | 0.762 | 0.269 | 294 | 8.939 | 1.00 | BH AT CLASSIFIER | 0% | 893.948 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 7 | 25.91 | 10.00 | * | 0.203 | 0.097 | 294 | 0.670 | 1.00 | BH AT FIN PROD SILO #1 | 0% | 67.046 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 8 | 28.96 | 10.00 | * | 0.229 | 0.335 | 294 | 2.794 | 1.00 | BH AT FIN PROD SILO #2 | 0% | 279.359 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP 9 | 19.81 | 10.00 | * | 0.229 | 0.335 | 294 | 2.794 | 1.00 | BH AT FIN PROD SILO #3 | 0% | 279.359 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP10 | 7.62 | 10.00 | * | 0.635 | 0.325 | 294 | 7.822 | 1.00 | BH AT BAG STATION #1 | 0% | 782.205 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP11 | 8.23 | 10.00 | * | 0.559 | 0.305 | 297 | 3.911 | 1.00 | BH AT BAG STATION #2 | 0% | 391.102 | | 33600 |
| * | Cyprus Grand405530 | 982030 | *Grand NBP12 | 19.51 | 10.00 | * | 0.381 | 0.300 | 283 | 3.911 | 1.00 | BH AT BAG STATION #3 | 0% | 391.102 | | 33600 |
| T* | Cyprus Grand405530 | 982030 | *Grand NBP13 | 30.48 | 10.00 | * | 0.559 | 0.274 | 294 | 26.818 | 1.00 | BH AT BAG STATION #4 | 0% | 2681.845 | | 33600 |
| * | Cyprus Grand405530 | 982030 | *Grand NBP14 | 11.89 | 10.00 | * | 0.432 | 0.361 | 294 | 2.235 | 1.00 | BH AT BULK RAIL LOAD | 0% | 223.487 | | 33600 |
| * | Cyprus Grand405530 | 982030 | *Grand NBP15 | 16.76 | 10.00 | * | 0.152 | 0.335 | 294 | 2.794 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 279.359 | | 33600 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 0.00 | 17657.98 | * 0.000 | 0.100 | 293 | 92.299 | 1.00 | ROAD EM. MINE TO PILE | 0% | 9229.883 | 33600 |
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 1.81 | 14.08 | * 0.000 | 0.100 | 293 | 0.046 | 1.00 | EM. UNLOADING TRUCK TO PIL | 0% | 4.596 | 33600 |
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 3.85 | 1.68 | * 0.000 | 0.100 | 293 | 0.325 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 32.461 | 33600 |
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 4.57 | 1170.58 | *15.240 | 0.100 | 293 | 0.257 | 1.00 | WIND EM. FROM FEED PILE | 0% | 25.738 | 33600 |
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 6.25 | 52.12 | * 0.000 | 0.100 | 293 | 0.039 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 3.885 | 33600 |
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 3.20 | 11.15 | * 0.000 | 0.100 | 293 | 0.008 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 0.831 | 33600 |

| PSPS | PLANT_NAME LATITUD | LONGITUD | UCITY | STT | STA | HEIGHT | AREA | VDIAMETE | VELOCI | TEMPE | EMISSIONS | ASSUM | DESCRIPTION | GIV | EMISSIONS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT* | Cyprus Grand405530 | 982030 | *Grand | NBF | 0 | 7.77 | 18.58 | * 0.000 | 0.100 | 293 | 0.014 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 1.385 | 33600 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 1 | 28.35 | 10.00 | * 0.330 | 0.239 | 294 | 1.667 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 166.657 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 2 | 26.82 | 10.00 | * 1.016 | 0.340 | 305 | 2.500 | 1.00 | BAGHOUSE AT DRYER | 0% | 249.986 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 3 | 27.43 | 10.00 | * 0.762 | 0.427 | 294 | 4.444 | 1.00 | BH AT HARDINGE CIRCUIT | 0% | 444.420 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 4 | 18.29 | 10.00 | * 0.381 | 0.351 | 303 | 2.500 | 1.00 | BH AT HDG MILL #1 | 0% | 249.986 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 5 | 18.59 | 10.00 | * 0.457 | 0.518 | 311 | 0.833 | 1.00 | BH AT HDG MILL #3 | 0% | 83.329 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 6 | 27.43 | 10.00 | * 0.762 | 0.269 | 294 | 2.222 | 1.00 | BH AT CLASSIFIER | 0% | 222.210 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 7 | 25.91 | 10.00 | * 0.203 | 0.097 | 294 | 0.167 | 1.00 | BH AT FIN PROD SILO #1 | 0% | 16.666 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 8 | 28.96 | 10.00 | * 0.229 | 0.335 | 294 | 0.694 | 1.00 | BH AT FIN PROD SILO #2 | 0% | 69.441 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 9 | 19.81 | 10.00 | * 0.229 | 0.335 | 294 | 0.694 | 1.00 | BH AT FIN PROD SILO #3 | 0% | 69.441 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 10 | 7.62 | 10.00 | * 0.635 | 0.325 | 294 | 1.944 | 1.00 | BH AT BAG STATION #1 | 0% | 194.434 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 11 | 8.23 | 10.00 | * 0.559 | 0.305 | 297 | 0.972 | 1.00 | BH AT BAG STATION #2 | 0% | 97.217 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 12 | 19.51 | 10.00 | * 0.381 | 0.300 | 283 | 0.972 | 1.00 | BH AT BAG STATION #3 | 0% | 97.217 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 13 | 30.48 | 10.00 | * 0.559 | 0.274 | 294 | 6.666 | 1.00 | BH AT BAG STATION #4 | 0% | 666.630 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 14 | 11.89 | 10.00 | * 0.432 | 0.361 | 294 | 0.556 | 1.00 | BH AT BULK RAIL LOAD | 0% | 55.552 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALP | 15 | 16.76 | 10.00 | * 0.152 | 0.335 | 294 | 0.694 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 69.441 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 0.00 | 17657.98 | * 0.000 | 0.100 | 293 | 22.943 | 1.00 | ROAD EM. MINE TO PILE | 0% | 2294.285 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 1.81 | 14.08 | * 0.000 | 0.100 | 293 | 0.011 | 1.00 | EM. UNLOADING TRUCK TO PIL | 0% | 1.142 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 3.85 | 1.68 | * 0.000 | 0.100 | 293 | 0.081 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 8.069 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 4.57 | 1170.58 | *15.240 | 0.100 | 293 | 0.064 | 1.00 | WIND EM. FROM FEED PILE | 0% | 6.398 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 6.25 | 52.12 | * 0.000 | 0.100 | 293 | 0.010 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 0.966 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 3.20 | 11.15 | * 0.000 | 0.100 | 293 | 0.002 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 0.207 | 8352 |
| AT* | Cyprus Alpin332050 | 861449 | *Alpine | ALF | 0 | 7.77 | 18.58 | * 0.000 | 0.100 | 293 | 0.003 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 0.344 | 8352 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 1 | 28.35 | 10.00 | * 0.330 | 0.239 | 294 | 19.954 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 1995.420 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 2 | 26.82 | 10.00 | * 1.016 | 0.340 | 305 | 29.931 | 1.00 | BAGHOUSE AT DRYER | 0% | 2993.130 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 3 | 27.43 | 10.00 | * 0.762 | 0.427 | 294 | 53.211 | 1.00 | BH AT HARDINGE CIRCUIT | 0% | 5321.120 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 4 | 18.29 | 10.00 | * 0.381 | 0.351 | 303 | 29.931 | 1.00 | BH AT HDG MILL #1 | 0% | 2993.130 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 5 | 18.59 | 10.00 | * 0.457 | 0.518 | 311 | 9.977 | 1.00 | BH AT HDG MILL #3 | 0% | 997.710 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 6 | 27.43 | 10.00 | * 0.762 | 0.269 | 294 | 26.606 | 1.00 | BH AT CLASSIFIER | 0% | 2660.560 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 7 | 25.91 | 10.00 | * 0.203 | 0.097 | 294 | 1.995 | 1.00 | BH AT FIN PROD SILO #1 | 0% | 199.542 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 8 | 28.96 | 10.00 | * 0.229 | 0.335 | 294 | 8.314 | 1.00 | BH AT FIN PROD SILO #2 | 0% | 831.425 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 9 | 19.81 | 10.00 | * 0.229 | 0.335 | 294 | 8.314 | 1.00 | BH AT FIN PROD SILO #3 | 0% | 831.425 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 10 | 7.62 | 10.00 | * 0.635 | 0.325 | 294 | 23.280 | 1.00 | BH AT BAG STATION #1 | 0% | 2327.990 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 11 | 8.23 | 10.00 | * 0.559 | 0.305 | 297 | 11.640 | 1.00 | BH AT BAG STATION #2 | 0% | 1163.995 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 12 | 19.51 | 10.00 | * 0.381 | 0.300 | 283 | 11.640 | 1.00 | BH AT BAG STATION #3 | 0% | 1163.995 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 13 | 30.48 | 10.00 | * 0.559 | 0.274 | 294 | 79.817 | 1.00 | BH AT BAG STATION #4 | 0% | 7981.681 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 14 | 11.89 | 10.00 | * 0.432 | 0.361 | 294 | 6.651 | 1.00 | BH AT BULK RAIL LOAD | 0% | 665.140 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTP | 15 | 16.76 | 10.00 | * 0.152 | 0.335 | 294 | 8.314 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 831.425 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTF | 0 | 0.00 | 17657.98 | * 0.000 | 0.100 | 293 | 274.699 | 1.00 | ROAD EM. MINE TO PILE | 0% | 27469.891 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTF | 0 | 1.81 | 14.08 | * 0.000 | 0.100 | 293 | 0.137 | 1.00 | EM. UNLOADING TRUCK TO PIL | 0% | 13.678 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTF | 0 | 3.85 | 1.68 | * 0.000 | 0.100 | 293 | 0.966 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 96.609 | 100000 |
| T* | Cyprus Three450500 | 1113000 | *Three | MTF | 0 | 4.57 | 1170.58 | *15.240 | 0.100 | 293 | 0.766 | 1.00 | WIND EM. FROM FEED PILE | 0% | 76.602 | 100000 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT* Cyprus Three | 450500 | 1113000 | *Three MTF 0 | 6.25 | 52.12 | * | 0.000 | 0.100 | 293 | 0.116 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 11.561 | 100000 |
| AT* Cyprus Three | 450500 | 1113000 | *Three MTF 0 | 3.20 | 11.15 | * | 0.000 | 0.100 | 293 | 0.025 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 2.473 | 100000 |
| AT* Cyprus Three | 450500 | 1113000 | *Three MTF 0 | 7.77 | 18.58 | * | 0.000 | 0.100 | 293 | 0.041 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 4.122 | 100000 |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 1 | 28.35 | 10.00 | * | 0.330 | 0.239 | 294 | 9.721 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 972.069 | ******* 48715. |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 2 | 26.82 | 10.00 | * | 1.016 | 0.340 | 305 | 14.581 | 1.00 | BAGHOUSE AT DRYER | 0% | 1458.104 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 3 | 27.43 | 10.00 | * | 0.762 | 0.427 | 294 | 25.922 | 1.00 | BH AT HARDINGE CIRCUIT | 0% | 2592.184 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 4 | 18.29 | 10.00 | * | 0.381 | 0.351 | 303 | 14.581 | 1.00 | BH AT HDG MILL #1 | 0% | 1458.104 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 5 | 18.59 | 10.00 | * | 0.457 | 0.518 | 311 | 4.860 | 1.00 | BH AT HDG MILL #3 | 0% | 486.035 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 6 | 27.43 | 10.00 | * | 0.762 | 0.269 | 294 | 12.961 | 1.00 | BH AT CLASSIFIER | 0% | 1296.092 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 7 | 25.91 | 10.00 | * | 0.203 | 0.097 | 294 | 0.972 | 1.00 | BH AT FIN PROD SILO #1 | 0% | 97.207 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 8 | 28.96 | 10.00 | * | 0.229 | 0.335 | 294 | 4.050 | 1.00 | BH AT FIN PROD SILO #2 | 0% | 405.029 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP 9 | 19.81 | 10.00 | * | 0.229 | 0.335 | 294 | 4.050 | 1.00 | BH AT FIN PROD SILO #3 | 0% | 405.029 | ******* |

| PSFSPLANT_NAME | LATITUD | LONGITUDU | CITY STTSTA | HEIGHT | AREA | V | DIAMETE | VELOCI | TEMPE | EMISSION | SASSUM | DESCRIPTION | GIV | EMISSIONS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP10 | 7.62 | 10.00 | * | 0.635 | 0.325 | 294 | 11.341 | 1.00 | BH AT BAG STATION #1 | 0% | 1134.081 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP11 | 8.23 | 10.00 | * | 0.559 | 0.305 | 297 | 5.670 | 1.00 | BH AT BAG STATION #2 | 0% | 567.040 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP12 | 19.51 | 10.00 | * | 0.381 | 0.300 | 283 | 5.670 | 1.00 | BH AT BAG STATION #3 | 0% | 567.040 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP13 | 30.48 | 10.00 | * | 0.559 | 0.274 | 294 | 38.883 | 1.00 | BH AT BAG STATION #4 | 0% | 3888.276 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP14 | 11.89 | 10.00 | * | 0.432 | 0.361 | 294 | 3.240 | 1.00 | BH AT BULK RAIL LOAD | 0% | 324.023 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXP15 | 16.76 | 10.00 | * | 0.152 | 0.335 | 294 | 4.050 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 405.029 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 0.00 | 17657.98 | * | 0.000 | 0.100 | 293 | 133.820 | 1.00 | ROAD EM. MINE TO PILE | 0% | 13381.960 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 1.81 | 14.08 | * | 0.000 | 0.100 | 293 | 0.067 | 1.00 | EM. UNLOADING TRUCK TO PIL | 0% | 6.663 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 3.85 | 1.68 | * | 0.000 | 0.100 | 293 | 0.471 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 47.063 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 4.57 | 1170.58 | * | 15.240 | 0.100 | 293 | 0.373 | 1.00 | WIND EM. FROM FEED PILE | 0% | 37.317 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 6.25 | 52.12 | * | 0.000 | 0.100 | 293 | 0.056 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 5.632 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 3.20 | 11.15 | * | 0.000 | 0.100 | 293 | 0.012 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 1.205 | ******* |
| AT* Pioneer | 310430 | 1045901 | *AllamoTXF 0 | 7.77 | 18.58 | * | 0.000 | 0.100 | 293 | 0.020 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 2.008 | ******* |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 1 | 28.35 | 10.00 | * | 0.330 | 0.239 | 294 | 6.574 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 657.371 | 32944 |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 2 | 26.82 | 10.00 | * | 1.016 | 0.340 | 305 | 9.861 | 1.00 | BAGHOUSE AT DRYER | 0% | 986.057 | 32944 |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 3 | 27.43 | 10.00 | * | 0.762 | 0.427 | 294 | 17.530 | 1.00 | BH AT HARDINGE CIRCUIT | 0% | 1752.990 | 32944 |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 4 | 18.29 | 10.00 | * | 0.381 | 0.351 | 303 | 9.861 | 1.00 | BH AT HDG MILL #1 | 0% | 986.057 | 32944 |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 5 | 18.59 | 10.00 | * | 0.457 | 0.518 | 311 | 3.287 | 1.00 | BH AT HDG MILL #3 | 0% | 328.686 | 32944 |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 6 | 27.43 | 10.00 | * | 0.762 | 0.269 | 294 | 8.765 | 1.00 | BH AT CLASSIFIER | 0% | 876.495 | 32944 |
| AT* Westex Miner | 310300 | 1044330 | *HoustoTXP 7 | 25.91 | 10.00 | * | 0.203 | 0.097 | 294 | 0.657 | 1.00 | BH AT FIN PROD SILO #1 | 0% | 65.737 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP 8 | 28.96 | 10.00 | * | 0.229 | 0.335 | 294 | 2.739 | 1.00 | BH AT FIN PROD SILO #2 | 0% | 273.905 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP 9 | 19.81 | 10.00 | * | 0.229 | 0.335 | 294 | 2.739 | 1.00 | BH AT FIN PROD SILO #3 | 0% | 273.905 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP10 | 7.62 | 10.00 | * | 0.635 | 0.325 | 294 | 7.669 | 1.00 | BH AT BAG STATION #1 | 0% | 766.933 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP11 | 8.23 | 10.00 | * | 0.559 | 0.305 | 297 | 3.835 | 1.00 | BH AT BAG STATION #2 | 0% | 383.467 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP12 | 19.51 | 10.00 | * | 0.381 | 0.300 | 283 | 3.835 | 1.00 | BH AT BAG STATION #3 | 0% | 383.467 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP13 | 30.48 | 10.00 | * | 0.559 | 0.274 | 294 | 26.295 | 1.00 | BH AT BAG STATION #4 | 0% | 2629.485 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP14 | 11.89 | 10.00 | * | 0.432 | 0.361 | 294 | 2.191 | 1.00 | BH AT BULK RAIL LOAD | 0% | 219.124 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXP15 | 16.76 | 10.00 | * | 0.152 | 0.335 | 294 | 2.739 | 1.00 | BH AT BULK TRUCK LOAD | 0% | 273.905 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 0.00 | 17657.98 | * | 0.000 | 0.100 | 293 | 90.497 | 1.00 | ROAD EM. MINE TO PILE | 0% | 9049.681 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 1.81 | 14.08 | * | 0.000 | 0.100 | 293 | 0.045 | 1.00 | EM. UNLOADING TRUCK TO PIL | 0% | 4.506 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 3.85 | 1.68 | * | 0.000 | 0.100 | 293 | 0.318 | 1.00 | EM. LOAD ORE W/FRONT END L | 0% | 31.827 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 4.57 | 1170.58 | * | 15.240 | 0.100 | 293 | 0.252 | 1.00 | WIND EM. FROM FEED PILE | 0% | 25.236 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 6.25 | 52.12 | * | 0.000 | 0.100 | 293 | 0.038 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 3.609 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 3.20 | 11.15 | * | 0.000 | 0.100 | 293 | 0.008 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 0.815 | 32944 |
| T* Westex Miner | 310300 | 1044330 | *HoustoTXF 0 | 7.77 | 18.58 | * | 0.000 | 0.100 | 293 | 0.014 | 1.00 | EM. FROM CONVEYORS AT CRUS | 0% | 1.358 | 32944 |
| T* Southern Tai | 344530 | 844530 | *ChatswGAP 1 | 28.35 | 10.00 | * | 0.330 | 0.239 | 294 | 5.099 | 1.00 | CRUSHER BAGHOUSE AT MINE | 0% | 509.950 | 25556 |

```
*AT* Southern Ta1344530  844530 *ChatswGAP 2 26.82      10.00 * 1.016 0.340 305      7.649 1.00 BAGHOUSE AT DRYER          0%   764.924          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 3 27.43      10.00 * 0.762 0.427 294     13.599 1.00 BH AT HARDINGE CIRCUIT     0%  1359.866          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 4 18.29      10.00 * 0.381 0.351 303      7.649 1.00 BH AT HDG MILL #1          0%   764.924          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 5 18.59      10.00 * 0.457 0.518 311      2.550 1.00 BH AT HDG MILL #3          0%   254.975          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 6 27.43      10.00 * 0.762 0.269 294      6.799 1.00 BH AT CLASSIFIER           0%   679.933          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 7 25.91      10.00 * 0.203 0.097 294      0.510 1.00 BH AT FIN PROD SILO #1     0%    50.995          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 8 28.96      10.00 * 0.229 0.335 294      2.125 1.00 BH AT FIN FROD SILO #2     0%   212.479          25556
*AT* Southern Ta1344530  844530 *ChatswGAP 9 19.81      10.00 * 0.229 0.335 294      2.125 1.00 BH AT FIN FROD SILO #3     0%   212.479          25556
*AT* Southern Ta1344530  844530 *ChatswGAP10  7.62      10.00 * 0.635 0.325 294      5.949 1.00 BH AT BAG STATION #1       0%   594.941          25556
*AT* Southern Ta1344530  844530 *ChatswGAP11  8.23      10.00 * 0.559 0.305 297      2.975 1.00 BH AT BAG STATION #2       0%   297.471          25556
*AT* Southern Ta1344530  844530 *ChatswGAP12 19.51      10.00 * 0.381 0.300 283      2.975 1.00 BH AT BAG STATION #3       0%   297.471          25556
*AT* Southern Ta1344530  844530 *ChatswGAP13 30.48      10.00 * 0.559 0.274 294     20.398 1.00 BH AT BAG STATION #4       0%  2039.798          25556
*AT* Southern Ta1344530  844530 *ChatswGAP14 11.89      10.00 * 0.432 0.361 294      1.700 1.00 BH AT BULK RAIL LOAD       0%   169.983          25556
*AT* Southern Ta1344530  844530 *ChatswGAP15 16.76      10.00 * 0.152 0.335 294      2.125 1.00 BH AT BULK TRUCK LOAD      0%   212.479          25556
*AT* Southern Ta1344530  844530 *ChatswGAF 0  0.00 17657.98 * 0.000 0.100 293     70.202 1.00 ROAD EM. MINE TO PILE      0%  7020.205          25556
*AT* Southern Ta1344530  844530 *ChatswGAF 0  1.81      14.08 * 0.000 0.100 293      0.035 1.00 EM. UNLOADING TRUCK TO FIL0%      3.495          25556
*AT* Southern Ta1344530  844530 *ChatswGAF 0  3.85       1.68 * 0.000 0.100 293      0.247 1.00 EM. LOAD ORE W/FRONT END L0%     24.689          25556
*AT* Southern Ta1344530  844530 *ChatswGAF 0  4.57    1170.58 *15.240 0.100 293      0.196 1.00 WIND EM. FROM FEED PILE    0%    19.576          25556
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IPSPSPLANT_NAME  LATITUDLONGITUDUCITY  STTSTAHEIGHTAREA     VDIAMETEVELOCITEMPEEMISSIONSASSUMDESCRIPTION              GIVEMISSIONS
*AT* Southern Ta1344530  844530 *ChatswGAF 0  6.25      52.12 * 0.000 0.100 293      0.030 1.00 EM. FROM CONVEYORS AT CRUS0%      2.955          25556
*AT* Southern Ta1344530  844530 *ChatswGAF 0  3.20      11.15 * 0.000 0.100 293      0.006 1.00 EM. FROM CONVEYORS AT CRUS0%      0.632          25556
*AT* Southern Ta1344530  844530 *ChatswGAF 0  7.77      18.58 * 0.000 0.100 293      0.011 1.00 EM. FROM CONVEYORS AT CRUS0%      1.053          25556
*AT* Cyprus Winds432305  724000 *West WVTP 1 28.35      10.00 * 0.330 0.239 294     24.933 1.00 CRUSHER BAGHOUSE AT MINE   0%  2493.277         124950
*AT* Cyprus Winds432305  724000 *West WVTP 2 26.82      10.00 * 1.016 0.340 305     37.399 1.00 BAGHOUSE AT DRYER          0%  3739.916         124950
*AT* Cyprus Winds432305  724000 *West WVTP 3 27.43      10.00 * 0.762 0.427 294     66.461 1.00 BH AT HARDINGE CIRCUIT     0%  6646.079         124900
*AT* Cyprus Winds432305  724000 *West WVTP 4 18.29      10.00 * 0.381 0.351 303     37.384 1.00 BH AT HDG MILL #1          0%  3738.420         124900
*AT* Cyprus Winds432305  724000 *West WVTP 5 18.59      10.00 * 0.457 0.518 311     12.461 1.00 BH AT HDG MILL #3          0%  1246.140         124900
*AT* Cyprus Winds432305  724000 *West WVTP 6 27.43      10.00 * 0.762 0.269 294     33.230 1.00 BH AT CLASSIFIER           0%  3323.040         124900
*AT* Cyprus Winds432305  724000 *West WVTP 7 25.91      10.00 * 0.203 0.097 294      2.492 1.00 BH AT FIN PROD SILO #1     0%   249.228         124900
*AT* Cyprus Winds432305  724000 *West WVTP 8 28.96      10.00 * 0.229 0.335 294     10.384 1.00 BH AT FIN FROD SILO #2     0%  1038.450         124900
*AT* Cyprus Winds432305  724000 *West WVTP 9 19.81      10.00 * 0.229 0.335 294     10.384 1.00 BH AT FIN PROD SILO #3     0%  1038.450         124900
*AT* Cyprus Winds432305  724000 *West WVTP10  7.62      10.00 * 0.635 0.325 294     29.077 1.00 BH AT BAG STATION #1       0%  2907.660         124900
*AT* Cyprus Winds432305  724000 *West WVTP11  8.23      10.00 * 0.559 0.305 297     14.538 1.00 BH AT BAG STATION #2       0%  1453.830         124900
*AT* Cyprus Winds432305  724000 *West WVTP12 19.51      10.00 * 0.381 0.300 283     14.538 1.00 BH AT BAG STATION #3       0%  1453.830         124900
*AT* Cyprus Winds432305  724000 *West WVTP13 30.48      10.00 * 0.559 0.274 294     99.691 1.00 BH AT BAG STATION #4       0%  9969.119         124900
*AT* Cyprus Winds432305  724000 *West WVTP14 11.89      10.00 * 0.432 0.361 294      8.308 1.00 BH AT BULK RAIL LOAD       0%   830.760         124900
*AT* Cyprus Winds432305  724000 *West WVTP15 16.76      10.00 * 0.152 0.335 294     10.384 1.00 BH AT BULK TRUCK LOAD      0%  1038.450         124900
*AT* Cyprus Winds432305  724000 *West WVTF 0  0.00 17657.98 * 0.000 0.100 293    343.236 1.00 ROAD EM. MINE TO PILE      0% 34323.629         124950
*AT* Cyprus Winds432305  724000 *West WVTF 0  1.81      14.08 * 0.000 0.100 293      0.171 1.00 EM. UNLOADING TRUCK TO PIL0%     17.090         124950
*AT* Cyprus Winds432305  724000 *West WVTF 0  3.85       1.68 * 0.000 0.100 293      1.207 1.00 EM. LOAD ORE W/FRONT END L0%    120.713         124950
*AT* Cyprus Winds432305  724000 *West WVTF 0  4.57    1170.58 *15.240 0.100 293      0.957 1.00 WIND EM. FROM FEED PILE    0%     95.714         124950
*AT* Cyprus Winds432305  724000 *West WVTF 0  6.25      52.12 * 0.000 0.100 293      0.144 1.00 EM. FROM CONVEYORS AT CRUS0%     14.446         124950
*AT* Cyprus Winds432305  724000 *West WVTF 0  3.20      11.15 * 0.000 0.100 293      0.031 1.00 EM. FROM CONVEYORS AT CRUS0%      3.090         124950
*AT* Cyprus Winds432305  724000 *West WVTF 0  7.77      18.58 * 0.000 0.100 293      0.052 1.00 EM. FROM CONVEYORS AT CRUS0%      5.150         124950
*AT* Cyprus Winds432806  723142 *West WVTP 1 28.35      10.00 * 0.330 0.239 294      9.879 1.00 CRUSHER BAGHOUSE AT MINE   0%   987.693          49506
*AT* Cyprus Winds432806  723142 *West WVTP 2 26.82      10.00 * 1.016 0.340 305     14.818 1.00 BAGHOUSE AT DRYER          0%  1481.839          49506
*AT* Cyprus Winds432806  723142 *West WVTP 3 27.43      10.00 * 0.762 0.427 294     10.760 1.00 BH AT HARDINGE CIRCUIT     0%  1075.984          20221
*AT* Cyprus Winds432806  723142 *West WVTP 4 18.29      10.00 * 0.381 0.351 303      6.052 1.00 BH AT HDG MILL #1          0%   605.241          20221
*AT* Cyprus Winds432806  723142 *West WVTP 5 18.59      10.00 * 0.457 0.518 311      2.017 1.00 BH AT HDG MILL #3          0%   201.747          20221
```

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP 6 | 27.43 | 10.00 | * | 0.762 | 0.269 | 294 | 5.380 | 1.00 | BH AT CLASSIFIER | 0% 537.992 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP 7 | 25.91 | 10.00 | * | 0.203 | 0.097 | 294 | 0.403 | 1.00 | BH AT FIN PROD SILO #1 | 0% 40.349 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP 8 | 28.96 | 10.00 | * | 0.229 | 0.335 | 294 | 1.681 | 1.00 | BH AT FIN PROD SILO #2 | 0% 168.122 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP 9 | 19.81 | 10.00 | * | 0.229 | 0.335 | 294 | 1.681 | 1.00 | BH AT FIN PROD SILO #3 | 0% 168.122 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP10 | 7.62 | 10.00 | * | 0.635 | 0.325 | 294 | 4.707 | 1.00 | BH AT BAG STATION #1 | 0% 470.743 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP11 | 8.23 | 10.00 | * | 0.559 | 0.305 | 297 | 2.354 | 1.00 | BH AT BAG STATION #2 | 0% 235.371 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP12 | 19.51 | 10.00 | * | 0.381 | 0.300 | 283 | 2.354 | 1.00 | BH AT BAG STATION #3 | 0% 235.371 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP13 | 30.48 | 10.00 | * | 0.559 | 0.274 | 294 | 16.140 | 1.00 | BH AT BAG STATION #4 | 0% 1613.976 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP14 | 11.89 | 10.00 | * | 0.432 | 0.361 | 294 | 1.345 | 1.00 | BH AT BULK RAIL LOAD | 0% 134.498 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTP15 | 16.76 | 10.00 | * | 0.152 | 0.335 | 294 | 1.681 | 1.00 | BH AT BULK TRUCK LOAD | 0% 168.122 | 20221 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 0.00 | 17657.98 | * | 0.000 | 0.100 | 293 | 135.998 | 1.00 | ROAD EM. MINE TO PILE | 0% 13599.794 | 49508 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 1.81 | 14.08 | * | 0.000 | 0.100 | 293 | 0.068 | 1.00 | EM. UNLOADING TRUCK TO PIL0% | 6.772 | 49508 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 3.85 | 1.68 | * | 0.000 | 0.100 | 293 | 0.478 | 1.00 | EM. LOAD ORE W/FRONT END L0% | 47.829 | 49508 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 4.57 | 1170.58 | * | 15.240 | 0.100 | 293 | 0.379 | 1.00 | WIND EM. FROM FEED PILE | 0% 37.924 | 49508 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 6.25 | 52.12 | * | 0.000 | 0.100 | 293 | 0.057 | 1.00 | EM. FROM CONVEYORS AT CRUS0% | 5.724 | 49508 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 3.20 | 11.15 | * | 0.000 | 0.100 | 293 | 0.012 | 1.00 | EM. FROM CONVEYORS AT CRUS0% | 1.224 | 49508 |
| *AT* Cyprus Winds432806 | 723142 | *West | WVTF 0 | 7.77 | 18.58 | * | 0.000 | 0.100 | 293 | 0.020 | 1.00 | EM. FROM CONVEYORS AT CRUS0% | 2.041 | 49508 |

Dana Putman
General Mgr.
315-287-0100

R. T. Vanderbilt Company, Inc.
INDUSTRIAL MINERALS AND CHEMICALS

30 WINFIELD STREET, NORWALK, CONNECTICUT 06855 • (203) 853-1400
CABLE: "BILTVAN", NORWALK, CONNECTICUT • TWX 710-468-2940

June 12, 1989

Ms. Beth Oliver
Industrial Studies Branch
Emissions Standards Division
Office of Air Quality Planning and Standards
U. S. Environmental Protection Agency
Research Triangle Park, NC 27711

Dear Ms. Oliver:

Further to your recent telephone conversation with Slim Thompson of this company, I enclose the following items:

1. Standard Method of Testing for Asbestos Containing Materials by Polarized Light Microscopy (ASTM Committee D22.05).

2. Two analyses of our talc grades, dated August 14, 1985 and February 13, 1987, by Ann G. Wylie.

3. "An Evaluation of Mineral Particles at Gouverneur Talc Company 1975 and 1982: A Comparison of Mineralogical Results between NIOSH and Dunn Geoscience Corporation", report by Dunn Geoscience Corporation.

4. "Mineral Characterization of Vanderbilt Talc Specimens", report by Arthur M. Langer and Robert P. Nolan.

5. "The Regulatory and Mineralogical Definitions of Asbestos and Their Impact on Amphibole Dust Analysis", article by John W. Kelse and C. Sheldon Thompson, accepted for publication in the Journal of the American Industrial Hygienists' Association.

Very truly yours,

R. T. VANDERBILT COMPANY, INC.

Paul Vanderbilt

Paul Vanderbilt
Vice President
Environmental Affairs

PV/sk
enclosure

cc: C. S. Thompson

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

4-80-47
I-C-1

20 JUN 1973

Mr. Allen Harvey
Patent and Legal Department
R. T. Vanderbilt Co., Inc.
33 Winfield Street
East Norwalk, Conn. 06855

Dear Mr. Harvey:

This letter is in response to your inquiry as to the applicability of the asbestos hazardous air pollutant standard to talc milling operations.

The proposed National Emission Standards for Hazardous Air Pollutants (NESHAPS) defined asbestos mill as a facility engaged in the conversion of asbestos ore into commercial asbestos. Since it has been determined that talc milling does not fit this definition, the asbestos standards do not apply to this operation. In addition, it has been determined that the asbestos standards do not apply to any manufacturing processes that use commercial or industrial talc as an ingredient (unless asbestos as defined by 40 CFR 61.21, with the above exception, is used in the process).

It should be noted that 40 CFR 61, NESHAPS, will be amended in order to properly clarify this situation.

Sincerely,

Richard D. Wilson
Director, Division of Stationary
Source Enforcement

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 16 1973

Mr. Charles Guck, Plant Engineer
Remington Arms, Inc.
Peters Cartridge Division
Bridgeport, Connecticut 06602

Dear Mr. Guck:

This letter is in response to your June 26, 1973, inquiry regarding the applicability of the national hazardous air pollutant standards for asbestos to your Bridgeport facility, which is engaged in the manufacture of rim-fire and shot shells for sporting ammunition. The specific operation in question is the manufacture of base wads, which involves the following steps: 1) the mixing of asbestos fibers, wood flour and paraffin wax in a steam-heated ribbon blender, 2) the storing of these materials in a silo, and 3) the feeding of these materials into a Colton tablet machine where the wads are formed into final base. You have described this operation during telephone conversations with J. DeSantis and J. Crowder of EPA. Based on these discussions, it does not appear that the regulations as presently written (40 CFR 61.22 (c)) include this operation in the list of manufacturing operations required to comply.

It should be pointed out, however, that there is a possibility that the regulations may be amended in the near future and that operations such as this may be covered by the revised regulation.

Sincerely,

William F. Johnson
for Richard D. Wilson, Director
Division of Stationary Source Enforcement

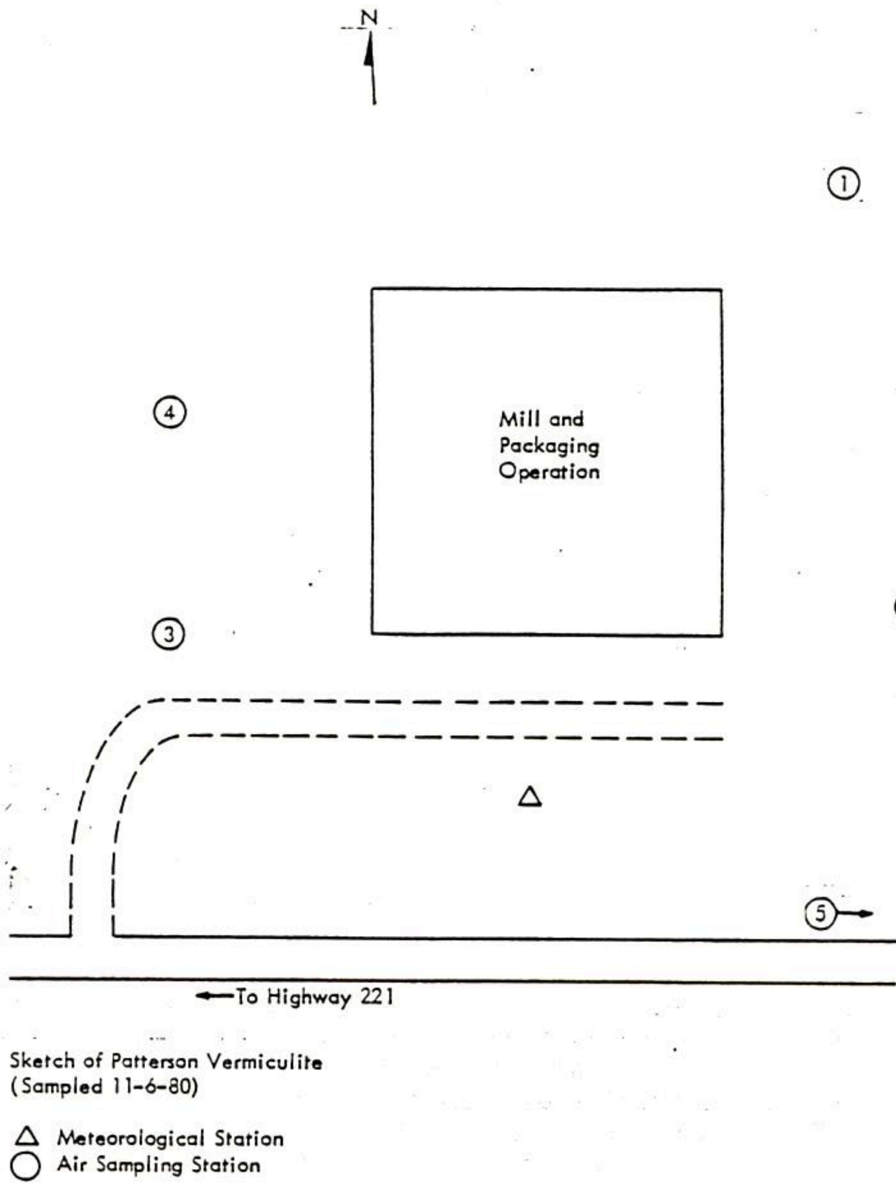


Figure 8. Map of the Patterson, Enoree, South Carolina, facility showing the stationary air sampling locations.

## SECTION 5

## SAMPLE HANDLING

All of the bulk samples were shipped air freight to MRI from the sampling sites. The air samples were hand-carried and maintained in a horizontal, sample-up position.

### BULK SAMPLES

Most of the bulk samples were collected as increment samples representing a span of time. Composite samples were prepared for this analysis. To prepare the composite samples, each increment sample was riffled to obtain a representative fraction of the increment. Approximately equal weight fractions of each of the increments were combined to make a composite sample. The composite sample was then mixed and riffled to produce four equal samples. One of the fourths was set aside and retained as a control. One of the fourths was again riffled to produce two fractions, each one-eighth of the original sample. These two fractions were combined with the other two fourths to result in the composite division into 1/4, 3/8, and 3/8 of the original composite. The "1/4" fraction was retained at MRI, one "3/8" fracton was sent to IITRI, and the other "3/8" fraction was sent to ORF for analysis.

A list of the bulk samples and the increment weights used to prepare the composites are given in Appendix D.

### AIR SAMPLES

The air sample filters were retained in the filter cartridges during transport to MRI. The top retainer portion of the cartridge was then removed and a cutting template positioned over the filter to allow the filter to be cut into three equal portions. The template held the filter around the circumference of the filter but did not contact the sampling portion of the filter. Each portion was then removed from the sampling cartridge and taped to the bottom surface of a 49 x 9 mm Millipore® plastic petrie dish. A set of one-third of each air sample filter was hand-carried to IITRI in Chicago, Illinois, and to ORF in Mississauga, Ontario.

TABLE 11. DENSITY-SEPARATED (AND HAND-PICKED) FRACTIONS PRODUCED

| Sample[a] | Wt % hand-picked fibers | Wt % tetrabromoethane sinks | Wt % 2.76 sinks | Wt % 2.76 floats |
|---|---|---|---|---|
| Libby Grace | | | | |
| Grade 1, 270-I | 4.5 | 9.8 | 5.1 | 85.1 |
| Grade 2, 276-I | 4.5 | 12.2 | 5.6 | 82.2 |
| Grade 3, 259-I | 1.0 | 9.1 | 22.6 | 68.3 |
| Grade 3, 259-I duplicate | - | 8.7 | | |
| Grade 4, 282-I | 0.3 | 10.9 | 14.1 | 75.0 |
| Grade 5, 264-I | - | 17.2 | 11.4 | 71.4 |
| Grade 5 (1-day), 267-I | - | 26.7 | 25.6 | 47.8 |
| Head feed, 291-I | - | 55.8 | 6.1 | 38.1 |
| Extractor, 294-I | 1.0 | 10.5 | 27.3 | 62.2 |
| Baghouse mill, 297-I | - | 2.7 | 17.6 | 79.8 |
| Screen plant, 288-I | - | 3.5 | 25.3 | 71.2 |
| S.C. Grace | | | | |
| Grade 4, 433-I | - | 3.9 | 48.9 | 47.2 |
| Grade 5, 427-I | - | 10.9 | 4.6 | 84.4 |
| Mill feed (+100 mesh), 436-I | - | 26.3 | 23.6 | 50.1 |
| Grade 3, expanded, 439-I | - | 0.2 | 0.4 | 99.4 |
| Grade 4, expanded, 442-I | - | ~ 0.4 | ~ 0.4 | ~ 99.2 |
| S.C. Patterson | | | | |
| Ungraded, 473-I | - | 18.1 | 13.9 | 68.0 |

a With the exception of Sample No. 267-I, all results are for composite samples.

TABLE 12. SUMMARY OF X-RAY DIFFRACTION ANALYSIS RESULTS

| Sample[a] | Fraction-Phase | Mineral phases identified from XRD data (exluding vermiculite) |
|---|---|---|
| Libby Grace | | |
| Grade 2, 276-I | TBE-SINK-fibers | Tremolite, talc |
| | TBE-SINK-milky, green | Tremolite, talc |
| | TBE-SINK-dk. green, glassy | Diopside, magnetite |
| | TBE-SINK-lt. green, glassy | Diopside, magnetite |
| Grade 3, 259-I | TBE-SINK-fibers | Tremolite |
| | TBE-SINK-total | Diopside, sphene, augite, fluorapatite |
| Grade 5, 264-I | TBE-SINK-fibers | Tremolite, diopside, sphene, talc, magnetite |
| | TBE-SINK-total | Diopside, tremolite, magnetite, fluorapatite, sphene, hematite, rhodonite |
| Grade 5 (1-day), 267-I | TBE-SINK-fibers | Tremolite, diopside, talc, sphene, augite, fluorapatite, quartz, magnetite |
| | TBE-SINK-total | Diopside, sphene, tremolite, augite, quartz, fluorapatite, magnetite, hematite |
| Head feed, 291-I | TBE-SINK-total | Diopside, tremolite, augite, fluorapatite, sphene, magnetite, hematite, quartz |
| | 2.76 SINK-total | Biotite, tremolite, vermiculite-hydrobiotite, diopside, quartz, talc, fluorapatite, sphene, calcite, magnetite, hematite |
| | 2.76 FLOAT-total | Tremolite, diopside, quartz, vermiculite-hydrobiotite, calcite, fluorapatite, talc, antigorite |

(continued)

TABLE 37. SUMMARY OF ELECTRON MICROSCOPY RESULTS FOR SAMPLE ENOREE, SOUTH CAROLINA, GRACE, GRADE 5

| Sample | Fibers of all lengths: Fiber concentration ($10^6$ fibers/g): Mean | 95% Confidence interval | Concentration equivalent to 1 fiber detected | Estimated mass concentration (ppm) | No. of fibers counted | Fibers greater than 5.0 μm in length: Fiber concentration ($10^6$ fibers/g): Mean | 95% Confidence interval | Concentration equivalent to 1 fiber detected | Estimated mass concentration (ppm) | No. of fibers counted | Fiber type[a] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 427-I | 0.6 | | | 1.5 | 4 | 0.1 | | | 0.91 | 1 | A |
| | 5.6 | 3.9-7.3 | 0.1 | | 39 | 1.3 | | 0.1 | | 9 | T |
| | | | | 0 | | | | | | 0 | C |
| 427-O | 17 | 8.1-25 | 1.27 | 37 | 13 | 2.6 | 0-6.4 | 1.27 | 32 | 2 | A |
| | 2.6 | 0-6.4 | 1.27 | < 1 | 2 | 1.3 | 0-4.1 | 1.27 | < 1 | 1 | C |
| 427-I (O)[b] | 3.0 | 0-6.3 | | 4.8 | 42 | 0.5 | | | 2.7 | 7 | A |
| | 0.07 | | 0.07 | $1 \times 10^{-4}$ | 1 | | | 0.07 | | 0 | C |
| 427-O (I)[b] | 31 | 13-48 | 1.29 | 130 | 24 | 2.6 | 0-6.4 | 1.29 | 93 | 2 | A |
| | 2.6 | 0-6.4 | 1.29 | < 1 | 2 | < 1.3 | - | 1.29 | - | 0 | C |
| | 5.2 | 0-14 | 1.29 | < 1 | 4 | < 1.3 | - | 1.29 | - | 0 | TM |
| | 23 | 11-36 | 1.29 | 4 | 18 | < 1.3 | - | 1.29 | - | 0 | UF |
| | 79 | 54-100 | 1.29 | 370 | 61 | 9.0 | 0-19 | 1.29 | 340 | 7 | NAM |
| | 140 | 100-180 | 1.29 | 500 | 109 | 12 | 0.8-22 | 1.29 | 440 | 9 | T |
| 427-I, Exfoliated | 3.5 | | | 4.1 | 7 | 0.5 | | | 2.4 | 1 | A |
| | 8.5 | | 0.5 | | 17 | 1.5 | | 0.5 | | 3 | T |
| | | | | | 0 | | | | | 0 | C |
| 427-O, Exfoliated | 2.9 | 0.9-4.9 | 0.293 | 120 | 10 | 1.5 | 0-3.0 | 0.293 | 120 | 5 | A |
| | < 0.3 | - | 0.293 | - | 0 | < 0.3 | - | 0.293 | - | 0 | C |
| 427-I (O) Exfoliated[b] | 3.2 | | | 7.3 | 12 | 1.3 | | | 4.9 | 5 | A |
| | | | 0.3 | | | | | 0.3 | | | T |
| | | | | | 0 | | | | | 0 | C |
| 427-O (I) Exfoliated[b] | 2.4 | 0.4-4.3 | 0.299 | 9 | 8 | 0.3 | 0-1.0 | 0.299 | 6 | 1 | A |
| | 0.9 | 0-2.9 | 0.299 | < 1 | 3 | < 0.3 | - | 0.299 | - | 0 | C |
| | 7.2 | 5.4-9.0 | 0.299 | 7 | 24 | 0.3 | 0-1.0 | 0.299 | 1 | 1 | UF |
| | 7.8 | 4.7-11 | 0.299 | 23 | 26 | 0.9 | 0-1.9 | 0.299 | 14 | 3 | NAM |
| | 18 | 15-21 | 0.299 | 38 | 61 | 1.5 | 0.3-2.6 | 0.299 | 22 | 5 | T |

a A = amphibole; C = chrysotlie; T = total; UF = unidentified mineral fiber; NAM = nonasbestos mineral; and TM = tubular morphology, not identifiable as chrysotile.

b The letter in the parentheses indicates that the counting procedure was that normally used by the other laboratory as 264-I (O) are the results obtained by IITRI using the ORF procedure.

Sample 436, Enoree, South Carolina, Grace, Head Feed, Composite

IITRI Code No. 131, ORF No. 435
Appendix references
Photographs E-10-12, XRD I-143-147
Electron microscope I-53-59, II-167-203

Macroscopically, the sample was observed to be quite varied in grain size, grain morphologies, and grain colors. Black to gold micaceous flakes up to 5 mm in diameter were major components. Dark to pale green glassy chunks up to 3 mm in diameter were present. Colorless to white irregular glassy fragments, some with obvious iron-staining, were as large as 15 mm. Milky white to light green irregular chunks were also as large as 15 mm.

The composition of the sample determined by PLM analyses of the density-separated fractions is presented in Table 38. This sample was primarily non-micaceous contaminant minerals, with less than 50% vermiculite.

TABLE 38. COMPOSITION OF SAMPLE 436-I

| Mineral phase | Estimated mass concentration (%) |
|---|---|
| Fibrous mixed amphiboles | < 1 |
| Anthophyllite-prismatic | 1-3 |
| Tremolite-actinolite | 6-9 |
| Sphene | 2-4 |
| Hornblende | 11-15 |
| Apatite | 2-4 |
| Magnetite, hematite | 1-3 |
| Rhodonite, pyrolucite | 1-2 |
| Calcite | 1-2 |
| Quartz, feldspars | 23-28 |
| Talc | 3-5 |
| Vermiculite | 32-40 |
| Other minerals | 1-3 |

Fibrous amphibole mineral phases were detected, mostly in the tetrabromoethane sinks fraction, but were less than 1% of the total sample. Both anthophyllite and tremolite-actinolite fibrous amphibole phases were detected. In addition, it is likely that fibrous hornblende was also incorporated within the fiber bundles.

The three major amphibole types present, anthophyllite, tremolite-actinolite, and hornblende, occurred predominantly as prisms. Fracture of hornblende prisms to yield particles classifiable as fibers is unlikely. However, the prisms of anthophyllite and tremolite-actinolite were obviously layereu and cleavable to particles definable as fibers.

Talc was again rather abundant and was also found as fracture fragments that might be classified as fibers.

The milky green, rough textured, irregular mineral grains were isolated from the TBS fraction and analyzed separately. Morphologies of the crushed fragments produced in grinding ranged from irregular to elongated prisms. Color and extinction characteristics (as observed on paralled-sided fragments) were consistent with tremolite-actinolite, but refractive indices were slightly lower than the indices of the glassy, obviously prismatic fragments of tremolite-actinolite observed in the sample. X-ray diffraction studies of this phase indicated this material was a sodium tremolite. A summary of the EM results for this sample appears in Table 39.

TABLE 39. SUMMARY OF ELECTRON MICROSCOPY RESULTS FOR SAMPLE ENOREE, SOUTH CAROLINA, HEAD FEED + 100 MESH

| | Fibers of all lengths | | | | | Fibers greater than 5.0 μm in length | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fiber concentration ($10^6$ fibers/g) | | | | | Fiber concentration ($10^6$ fibers/g) | | | | | |
| Sample | Mean | 95% Confidence interval | Concentration equivalent to 1 fiber detected | Estimated mass concentration (ppm) | No. of fibers counted | Mean | 95% Confidence interval | Concentration equivalent to 1 fiber detected | Estimated mass concentration (ppm) | No. of fibers counted | Fiber type[a] |
| 436-I | 0.3 | | | 0.49 | 12 | 0.1 | | | 0.43 | 5 | A |
| | 2.2 | 0.5-3.9 | 0.03 | | 82 | 0.2 | | 0.3 | | 8 | T |
| | | | | | 0 | | | | | 0 | C |
| 436-0 | 12 | 7.1-16 | 0.160 | 22 | 73 | 1.0 | 0.1-1.8 | 0.160 | 16 | 6 | A |
| | 0.3 | 0-0.8 | 0.160 | < 1 | 2 | 0.2 | 0-0.5 | 0.160 | < 1 | 1 | C |
| 436-I, Exfoliated | 1.3 | | | 0.81 | 3 | | | | | 0 | A |
| | 5.1 | | 0.4 | | 12 | 0.4 | | 0.4 | | 1 | T |
| | | | | | 0 | | | | | 0 | C |

a A = amphibole (SAED); C = chrysotile; and T = total.

## Sample 439, Enoree, South Carolina, Grade 3, Commercially Exfoliated

IITRI Code No. 133, ORF No.
Appendix references
Electron microscope I-120-121

The sample was typical in appearance of expanded vermiculite used as packing material or soil conditioning material. Individual particles were obviously composed of multiple, stacked vermiculite plates. Colors of the stacks ranged from white to tan to brown to light green. Diameters of the plates ranged from 1 to 5 mm. Lengths of the expanded stacked plates were quite variable and ranged up to 15 mm. Non nonmicaceous mineral phases were detected in the gross, stereomicroscopic inspection of the sample.

Density separations did not yield much higher density (greater than 2.76) material. Table 40 lists the mineralogical composition of the sample determined by the polarized light microscopy analyses.

TABLE 40. COMPOSITION OF SAMPLE 439-I

| Mineral phase | Estimated mass concentration (%) |
|---|---|
| Fibrous mixed amphibole | < 1 |
| Anthophyllite-prismatic | < 1 |
| Tremolite-actinolite | < 1 |
| Sphene | < 1 |
| Augite | < 1 |
| Apatite | 1-3 |
| Hornblende | < 1 |
| Magnetite, hematite | 1-2 |
| Rhodonite, pyrolucite | < 1 |
| Calcite | < 1 |
| Quartz | 1-3 |
| Talc | 1-2 |
| Vermiculite | 85-95 |
| Other minerals | 1-3 |

habit. While fracture of the prismatic anthophyllite could yield fragments classifiable as fibers, this fracture was not readily accomplished; irregular, jagged fragments tended to be produced.

The prismatic to coarse fibrous mineral phases found in abundance in the 2.76 sink fraction were isolated and carefully examined. The particles were found to be composed almost exclusively of talc and anthophyllite. Tremolite-actinolite was only a trace constituent of this fraction. Grinding of the particles resulted in ready fracture of both the talc and anthophyllite into long, thin, parallel-sided fragments classifiable as fibers. Larger fragments showed splintered ends suggestive of fiber bundles.

Unlike the Grace samples from South Carolina, the Patterson sample contained predominantly rutile rather than sphene titanium phases. Some of the rutile was found in elongated, thin crystal habits. A summary of the EM results for this sample appears in Table 44.

TABLE 44. SUMMARY OF ELECTRON MICROSCOPY RESULTS FOR SAMPLE ENOREE, SOUTH CAROLINA, PATTERSON, UNGRADED

| | Fibers of all lengths | | | | | Fibers greater than 5.0 μm in length | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fiber concentration ($10^6$ fibers/g) | | | | | Fiber concentration ($10^6$ fibers/g) | | | | | |
| Sample | Mean | 95% Confidence interval | Concentration equivalent to 1 fiber detected | Estimated mass concentration (ppm) | No. of fibers counted | Mean | 95% Confidence interval | Concentration equivalent to 1 fiber detected | Estimated mass concentration (ppm) | No. of fibers counted | Fiber type[a] |
| 573-I | 0.03 | | 0.03 | $3.7 \times 10^{-4}$ | 1 | | | | | | A |
| | 0.8 | | | | 29 | 0.03 | | 0.03 | | 1 | T |
| | 0.03 | | | $1.4 \times 10^{-4}$ | 1 | | | | | | C |
| 573-O | 1.7 | 0.6-2.9 | 0.244 | 27 | 7 | 0.5 | 0-1.2 | 0.244 | 26 | 2 | A |
| | < 0.3 | - | 0.244 | - | 0 | < 0.3 | - | 0.244 | - | 0 | C |
| 573-I, Exfoliated | 0.5 | | | 3.0 | 3 | 0.2 | | | 2.4 | 1 | A |
| | 3.7 | | 0.2 | | 21 | 0.5 | | 0.2 | | 3 | T |
| | 0.2 | | | $5.3 \times 10^{-3}$ | 1 | | | | | 0 | C |
| 573-O, Exfoliated | 1.1 | 0.1-2.0 | 0.265 | 4 | 4 | 0.3 | 0-0.9 | 0.265 | 4 | 1 | A |
| | < 0.3 | - | 0.265 | - | 0 | < 0.3 | - | 0.265 | - | 0 | C |

a A = amphibole (SAED); C = chrysotile; and T = total.

## Air Sample, Phase Contract Results

The results of the examination of the air sample filters by phase contrast analysis are presented in Table 45.

TABLE 45. RESULTS OF THE PHASE CONTRAST ANALYSIS OF AIR SAMPLES COLLECTED AT THREE VERMICULITE SITES

| Sample | Sample vol. (ℓ) | Fibers/cc ORF | Fibers/cc IITRI |
|---|---|---|---|
| Libby, Grace | | | |
| 106 Field blank[a] | - | < 0.02 | 0.04 |
| 133 Field blank[a] | - | 0.03 | 0.05 |
| 131 Front loader | 303 | 0.02 | 0.04 |
| 148 Pit haul driver | 297 | < 0.01 | 0.01 |
| 138 Mine analyst | 294 | 1.5 | 1.9 |
| 141 Bottom operator | 276 | 1.2 | 0.4 |
| 130 No. 2 operator | 285 | 3.1 | 9.7 |
| 139 Dozer operator | 270 | 0.02 | 0.2 |
| 101 Shuttle truck | 385 | 0.1 | 0.2 |
| 104 Screening plant, DW | 390 | 0.08 | 0.5 |
| 111 Screening plant, DW | 368 | 0.1 | 0.02 |
| 108 Trailer court | 169 | 0.03 | ND[b] |
| 136 No. 5 substation | 111 | 0.03 | 0.02 |
| South Carolina, Grace | | | |
| 312 Field blank[a] | - | < 0.02 | 0.04 |
| 346 Field blank[a] | - | < 0.02 | 0.02 |
| 340 Mill monitor | 340 | 0.03 | 0.03 |
| 321 Mill lab technician | 478 | 0.07 | 0.2 |
| 301 Dragline operator | 240 | < 0.01 | ND[b] |
| 347 No. 4 bagger | 314 | 0.06 | 0.1 |
| 330 No. 3 bagger | 285 | 0.1 | 0.05 |
| 328 Mill (ENE) downwind | 287 | 0.05 | 0.04 |
| 335 Mill (N) crosswind | 80 | 0.04 | ND[b] |
| 307 Mine (N) crosswind | 291 | < 0.01 | 0.02 |
| 323 Mine (E) downwind | 154 | 0.01 | 0.02 |
| 338 Mine (W) upwind | 264 | 0.03 | 0.01 |
| 310 Truck driver | 257 | < 0.01 | 0.3 |
| 300 Screening plant floor | 354 | 0.06 | 0.14 |
| South Carolina, Patterson | | | |
| 505 Field blank[a] | - | < 0.02 | < 0.01 |
| 533 Field blank[a] | - | < 0.02 | 0.02 |
| 508 Payload operator | 255 | < 0.01 | 0.04 |
| 520 Plant foreman | 252 | 0.01 | 0.3 |
| 542 Bagger/forklift | 249 | < 0.01 | 0.1 |
| 513 (NE) downwind | 188 | < 0.01 | ND[b] |
| 506 Control off-site | 274 | < 0.01 | ND[b] |
| 515 (SE) crosswind | 299 | 0.01 | 0.01 |
| 528 (SW) upwind | 147 | 0.02 | ND[b] |

a Values for blanks were calculated assuming a 100-liter sample.

b ND: No fibers detected (100 grids).